



REPORT

OF THE

SUDAN MEDICAL SERVICE

FOR THE YEAR

1935

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ANNUAL REPORT 1935.

SUDAN MEDICAL SERVICE.

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GENERAL HEALTH.

The public health of the Sudan was satisfactory throughout the year, with the exception of a severe epidemic of cerebrospinal meningitis, in Kordofan and Darfur Provinces.

The incidence of malaria shows a reduction. This was particularly noticeable in the Northern Province, where the recent increase of staff in Shendi and Berber districts has enabled the public health service to extend its protected areas to cover practically the whole population.

The incidence of bilharziasis in the irrigated area of the Gezira remains low.

In general, the standard of living of the Sudanese is improving steadily year by year, and this is particularly noticeable in Kassala and Blue Nile Provinces, where the people are far better off than they were ten years ago.

The population is increasing rapidly, and, although statistics are difficult to obtain in many districts, the swarms of children in the villages provide striking evidence.

HEALTH OF OFFICIALS.

Nationality	Number of Officials employ- ed	Total		Average days' sickness		D i e d	Invalided
		Placed on sick list	No. of days' sickness	For all offic- ials	For those who were sick		
British	798	118	1055	1.32	8.94	1	3
Sudanese	3227	531	4578	1.42	8.62	5	13
Egyptians	559	91	652	1.17	7.16	3	1
Syrians	54	2	12	0.22	6.00	-	-

The comparative figures for the past five years are as follows :—

	1931	1932	1933	1934	1935
British.					
Days' Sickness	2.46	2.05	1.26	1.33	1.32
Died	8	5	2	2	1
Invalided	5	5	4	2	3
Sudanese.					
Days' Sickness	1.70	1.75	1.65	1.56	1.42
Died	13	5	10	8	5
Invalided	7	5	6	7	13
Egyptians.					
Days' Sickness	1.30	0.84	1.21	1.09	1.17
Died	1	1	4	3	3
Invalided	11	2	1	—	1
Syrians.					
Days' Sickness	1.10	0.80	0.80	2.43	0.22
Died	—	1	—	—	—
Invalided	—	2	—	—	—

Assuming that a British official works for nine complete months in the year, the total number of days lost by sickness in 1935 is equivalent to the loss of 3.9 officials, and compares with previous years as follows :—

1930	6.3	1933	3.6
1931	8.5	1934	3.8
1932	5.9	1935	3.9

The following table shows the number of days lost by officials in various provinces, over a period of five years :—

		N. Bahr el Ghazal	Berber	Blue Nile	Darfur	Dongola	Fung	Halfa	Kassala	Kordofan	Mongalla	Port Sudan and Suakin	Upper Nile	White Nile
British.														
1931	...	3.3	1.1	1.4	2.9	1.8	1.7	0.7	0.8	1.7	1.7	1.8	3.7	1.0
1932	...	2.5	0.64	2.0	0.82	0.42	6.0	—	0.8	3.0	3.1	0.7	3.0	0.4
1933	...	3.0	1.0	2.3	0.9	3.4	3.5	0.55	1.5	2.5	3.8	0.9	1.3	2.5
1934	...	2.0	0.3	1.2	1.8	0.6	2.6	1.4	1.3	0.7	3.3	0.9	2.4	5.2
1935	...	4.3	0.3	1.5	1.0	1.9	2.7	—	0.7	1.3	2.0	0.3	4.4	1.8
Sudanese.														
1931	...	1.4	0.4	1.0	0.1	2.0	1.3	1.9	2.9	0.9	6.3	1.7	1.2	2.3
1932	...	1.5	0.4	2.1	2.2	2.2	1.2	0.55	1.3	1.6	2.5	0.4	1.7	1.2
1933	...	3.0	0.7	1.6	1.3	1.4	3.6	1.4	1.2	3.1	2.8	0.3	3.8	2.4
1934	...	2.1	0.6	1.2	3.8	1.1	1.6	1.6	1.8	2.4	4.0	0.9	6.6	1.7
1935	...	4.1	1.0	1.4	1.9	1.0	3.1	1.0	1.2	1.1	2.8	1.1	5.5	1.7
Egyptians.														
1931	...	4.8	0.4	2.2	5.8	0.7	2.3	1.6	0.7	1.0	3.9	0.9	1.0	2.0
1932	...	1.5	0.6	1.2	—	—	0.17	1.0	0.2	0.3	1.0	1.1	1.8	0.8
1933	...	0.55	0.9	1.9	—	—	1.8	0.55	0.9	1.5	2.0	1.8	3.6	1.3
1934	...	2.4	0.6	0.4	1.8	—	3.3	—	1.3	1.1	3.5	0.2	6.0	—
1935	...	5.0	0.5	1.0	3.0	1.0	0.5	1.0	1.9	1.8	0.7	0.1	5.2	4.3

The numbers concerned are too small to enable accurate deductions to be made.

EPIDEMIC DISEASES.

Anthrax.

In March a small outbreak was reported in one clan of the Katla Nubas.

An Arab, whose cattle grazed on the pastures adjoining those of the clan lost an animal from disease some 20 days before the attack was notified.

The Nubas helped to eat the animal.

There were seven cases with four deaths. Of the survivors, one had a malignant pustule on his lower jaw, one on the neck and one on the side of the chest.

It was impossible to get further details from the Arab as he had left the district, perhaps wisely, and could not be traced.

Cerebrospinal Meningitis.

3249 cases with 2154 deaths were reported during the year. The incidence for the last eight years was as follows :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1928 ...	335	274	1932 ...	532	384
1929 ...	464	340	1933 ...	166	131
1930 ...	865	665	1934 ...	4231	3341
1931 ...	348	240	1935 ...	3249	2154

The severe epidemic in Kordofan Province, which died down in July, 1934 on the onset of the rains, recommenced in November, 1934, and raged until July, 1935, when it died out immediately the rains started. It recommenced in Kadugli area, in November.

In June it spread into Darfur Province, where it also ceased during the rains but recommenced in November.

A small outbreak, with 48 cases and 32 deaths occurred at Rufaa and Meringan, in Blue Nile Province in May.

Sporadic cases were reported in Northern, Khartoum, Blue Nile, White Nile and Bahr el Ghazal Provinces, and from Port Sudan.

Kordofan Province.

Dr. Elliott, Senior Medical Inspector, Kordofan Province, reports as follows, regarding the severe epidemic which occurred in that Province :—

“ The epidemic which occupied the first six months of 1935 actually started in late November, 1934, with a small outbreak at Heiban. Strict quarantine measures were applied at once and no further cases occurred there. By mid-December cases began to occur in the neighbouring Otoro Hills, and by the end of December a few cases had occurred in Kadugli District. Spread from Otoro Hills was mainly southward to Tira el Akhdar and the Moro Hills and from Kadugli southwest.

These areas had not been affected by the epidemic of 1934.

The northern part of the Kowalib hills had a few cases in 1934 just at the end of the epidemic, and was infected again in the latter part of this one. In the Nymang Hills of Dilling District a serious outbreak began in February, 1935. There had been a small outbreak at Fassu in 1934 confined to one hill. This year however, the disease was widespread, 33 villages being infected.

In spite of strict quarantine precautions and picketing of roads the disease spread from the Nymang Hills westward to Abu Zabad area. The spread was actually traced to one man who had evaded a police post, and contracted the disease on his arrival at Shifr.

Eastern Kordofan began to have cases at the end of January. This area had been badly hit in 1934. No less than 155 villages were infected then. It is noteworthy that, although the epidemic in 1935 was in roughly the same area, in only 25 villages of those infected in 1934 did cases occur again, while 28 new villages suffered.

In contrast to this, in the Nuba Mountains it was found that the areas affected in 1934 were in almost all cases completely free in 1935, the disease in some cases starting practically where it left off in 1934.

El Obeid again was infected : it has been infected each year since 1930. A mild epidemic occurred in Central District and spread in May to northern Kordofan. The spread was very rapid in spite of the long distances between villages, but, fortunately, infection being late in the season, the casualties were not great before the close of the epidemic at the beginning of the rains.

The measures taken may be divided into general and therapeutic :—

1. General measures were :

- (a) Propaganda aimed at getting early information of new outbreaks.
- (b) Propaganda aimed at encouraging the people themselves to take prophylactic measures such as keeping out of doors, avoiding crowds, not visiting sick people, avoiding people from infected villages and so on.

The custom of general visitation of the sick is undoubtedly a big factor in the spread of cerebrospinal meningitis, and one which is very difficult to stop.

- (c) Complete evacuation of villages.
- (d) Quarantines were established for the sick and separate ones for contacts. These were under the supervision of medical staff, police, and watchmen. This staff made daily visits to the villages to see that people were not returning to their houses, kept up propaganda work and sent reports as to the progress of the disease to the headquarters of the districts.
- (e) In El Obeid it was possible to make more stringent regulations with a view to prohibiting burials without a medical certificate, the holding of dances, etc.

The total number of cases in the whole province was 2,999, with 1,980 deaths, a mortality rate of 66% compared with 78% in 1934. In the Nuba Mountains, the rate was 64%, elsewhere 69%. Distribution of cases was as follows:—

				Cases.	Deaths.	% Mortality.
Nuba Mountains	...	...	...	1926	1235	64%
Rashad Area	...	...	...	345	277	80%
Western Kordofan	...	...	...	133	105	79%
Eastern Kordofan	...	...	...	298	145	49%
El Obeid	...	...	...	134	99	74%
Central District	...	...	...	90	67	74%
Northern Kordofan	...	...	...	73	52	72%

An analysis of 917 cases in the rest of Kordofan is compared below with the Nuba Mountains as regards age incidence:—

Age.			Males.	Females.	Total.	%	Nuba Mountains.
0-5	...	...	107	81	188	20.5	20%
6-10	...	...	182	83	265	28.9	30%
11-15	...	...	78	36	114	12.4	18%
16-20	...	...	92	26	118	12.8	10%
21-30	...	...	102	37	139	15.2	11%
30-40	...	...	29	11	40	4.4	2.6%
Over 40	...	...	30	23	53	5.8	1.5%
Undefined	...	...	—	—	—	—	6.9%

It is noticeable that, while in the Nuba Mountains only 30 out of 1926 cases were over 40, in the rest of Kordofan, an Arab area, no less than 53 out of 917 were over 40.

In the epidemic of 1934, 91% of cases were reported as being under 20 years of age. In this epidemic 74% of Arab and 78% of Nuba cases were under 20.

Epidemiology.

The onset of the rainy season stops the epidemic temporarily.

It has been found that a number of village outbreaks have come to an end approximately ten weeks after the first cases had been reported.

For quarantine purposes, it is important to find out if this means that all the susceptible members of the population have been affected in this time, or that a general immunity has developed in the population.

Experience in this epidemic has shown that, when the disease recurs after the rainy season, villages which have suffered heavily previously, are spared. This, of course, would fit in with either theory. But it is found that, when a few cases have occurred in the first epidemic, the village is often heavily attacked in the second, indicating that immunity has not been acquired, and that the disease had not time to attack all the susceptibles before the rains came.

Two cases are recorded of persons who contracted the disease twice, and both died from the second attack.

2. Treatment.

Vaccine treatment has been tried as a prophylactic measure and has been found to be useless.

Stock anti-serum has also been found to be of little use, and this was confirmed by the Assistant Director, Laboratory Services, who found that the local strain of meningococci did not conform to standard types in their reactions.

Lumbar puncture was carried out as a routine where possible, with surprisingly little effect on the mortality rate of the disease.

An experiment is at present being carried out with Vitamin A extract as a prophylactic by Dr. Corkill, Medical Inspector, Southern Kordofan with interesting results. (See page 66.)

Darfur Province.

For the first time since the occupation of Darfur in 1917 the disease made its appearance in epidemic form.

The epidemic commenced in April, ceased in July, recommenced in October and was increasing at the end of year.

Dar Masalit, El Fasher, and Nyala were the principal areas affected. 175 cases with 159 deaths had occurred by the end of the year.

DIPHTHERIA.

60 cases were reported as follows :—

Northern Province	...	...	21	Kassala Province	...	...	7
Kordofan Province	...	...	1	Darfur Province	...	...	5
Khartoum Province	...	...	23	Blue Nile Province	...	...	2
Bahr-el-Ghazal Province	...	...	1				

The incidence for the last six years is :—

1930	...	...	...	...	68	1933	...	...	...	...	51
1931	...	...	...	...	183	1934	...	...	...	...	34
1932	...	...	...	...	138	1935	...	...	...	...	60

In Halfa district there were 19 cases reported during the year. A small outbreak, limited to 9 cases with five deaths, occurred at Gamai. Only two cases were reported from the Batn el Hajar where, four years ago, it was found necessary to open a dispensary owing to the high incidence of the disease.

The value of diphtheria anti-toxin is now appreciated by the inhabitants, and, consequently, people usually come under treatment at an early stage of the disease.

INFLUENZA.

Mild epidemics were reported in all parts of the country. There were 865 cases with 8 deaths compared with 2201 cases with 13 deaths in 1934.

SMALLPOX.

The incidence of this disease remained low. The mild variety previously reported continued to linger on the Wau district. 28 cases were reported with no deaths.

3 cases of the severe variety occurred among returning pilgrims. Fortunately, owing to the vaccination of the pilgrims before their departure, no deaths resulted.

The length of quarantine—five days—is insufficient to protect against smallpox, and the cases developed after their discharge from quarantine, in Kassala, Northern and White Nile Provinces.

As the cases were reported at once, and the population of the northern Sudan is well protected by vaccination, only two locally infected cases resulted, with no deaths.

A few cases were reported in May from Nasser district in the Upper Nile Province, as the result of an epidemic which had been raging in Western Abyssinia.

ENDEMIC DISEASES.

ANCYLOSTOMIASIS.

NORTHERN SUDAN.

This disease is of no public health importance although a few small foci of infection occur in the Northern Province.

SOUTHERN SUDAN.

Bahr el Ghazal. 28% of patients admitted to Wau hospital are found to be infected. The disease produces marked symptoms among the Nilotic tribes of this province, and it is the only part of the Sudan where patients frequently report sick with marked anaemia due to the disease.

Mongalla Province. 35% of the patients admitted to Li Rangu hospital are found to be infected, but it is symptomless in nearly all cases.

498 cases were diagnosed and treated at Juba hospital.

BLACKWATER FEVER.

18 cases were reported with nine deaths.

The figures for the last six years are as follows :—

								Cases.	Deaths.
1930	...	...	...	...	...	...	...	70	6
1931	...	...	...	...	...	...	...	43	20
1932	...	...	...	...	...	...	...	66	23
1933	...	...	...	...	...	...	...	38	12
1934	...	...	...	...	...	...	...	34	9
1935	...	...	...	...	...	...	...	18	9

The race incidence for 1934 in relation to the 12th. parallel of north latitude was as follows :—

						North of 12th. parallel		South of 12th. parallel	
						Cases.	Deaths.	Cases.	Deaths.
Sudanese Arab	...	...	...	...	...	5	4	6	1
Sudanese Negroid	...	...	...	...	...	1	1	—	—
Canadian	...	...	...	...	...	—	—	1	—
Egyptian	...	...	...	...	...	—	—	1	1
Greek	...	...	...	...	...	—	—	2	1
Italian	...	...	...	...	...	1	1	1	—
TOTAL						7	6	11	3

The percentage of cases occurring south of the 12th. parallel for the last four years is as follows :—

				%					%
1932	...	...	...	...	59	1934	...	...	59
1933	...	...	...	...	60	1935	...	...	62

DRACONTIASIS.

This disease is endemic in the southern Sudan where it is the cause of considerable disability. It is also common in the Nuba Mountains.

The incidence is being reduced by the provision of properly constructed wells in the endemic areas.

PROVINCE.							Cases. treated.
Bahr El Ghazal	...	...	...	...	...	...	1734
Mongalla	...	...	...	...	...	...	590
Kordofan	...	...	...	...	...	...	83
Darfur	...	...	...	...	...	...	30
Blue Nile	...	...	...	...	...	...	16
Upper Nile	...	...	...	...	...	...	7
Khartoum	...	...	...	...	...	...	3
Kassala	...	...	...	...	...	...	1
Northern	...	...	...	...	...	...	1
TOTAL						...	2465

DYSENTERY.

2,753 cases were admitted to hospital, of whom 2519 were amoebic and 234 bacillary.

The incidence of bacillary dysentery is slowly diminishing as sanitary conditions improve. Khartoum, Kassala, Fasher and Wad Medani shew a reduction in incidence this year as the result of an improved sanitary organisation.

On the other hand, the incidence of amoebic dysentery in the rural districts of Khartoum Province shows a marked increase.

The following table show the admissions to hospital for each of these two diseases given as the percentage of the total admissions for all cases for 1935 and the preceeding seven years :—

					1928	1929	1930	1931	1932	1933	1934	1935
Amoebic Dysentery	...	...	...	...	3.40	3.02	2.68	3.28	2.51	3.25	3.00	2.83
Bacillary Dysentery	...	...	...	...	0.80	0.75	0.37	0.41	0.41	0.38	0.28	0.26
TOTAL					4.20	3.77	3.05	3.69	2.92	3.63	3.28	3.09

HYDATID DISEASE.

This disease occurs in the Kapoeta district of Mongalla Province where eight cases were reported in 1935, compared with 24 in 1934.

A case was reported at Wau. This is the first recorded case from this district.

KALA-AZAR.

The incidence of this disease shows a decrease in most districts. 171 cases were reported compared with 289 in 1934.

The reduced incidence in the Blue Nile Province is probably a result of the intensive investigations carried out by Sir Robert Archibald and Dr. Henderson in the Blue Nile Province last year, with the consequent diagnosis and treatment of all cases obtainable.

Special efforts have been made to improve the sanitary condition of villages in the endemic areas, as this investigation appears to show that the occurrence and spread of the disease is connected with bad housing, dirt, and over-crowding, under which conditions it is transmitted directly from man to man.

BLUE NILE PROVINCE.

73 cases were reported, compared with 127 in 1934.

The following have been treated in hospital :—

DISTRICT	ADULTS.		CHILDREN.	
	Male.	Female.	Male.	Female.
Blue Nile	5	1	3	1
Fung and Sennar	37	8	13	5
TOTAL	42	9	16	6

The nationalities of these cases were as follows :—

Arab	42	West Africans	4
Negroid	25	Abyssinians	2

The deaths remained at about 40%. Many cases appear to be resistant to both tartar emetic and neostibosan treatment.

MONGALLA PROVINCE.

49 cases were reported with 18 deaths in the Kapoeta District, compared with 86 cases and two deaths in 1934.

DARFUR PROVINCE.

Four cases were reported as against 17 in 1934.

LEPROSY.

At the end of the year 2,698 lepers were in camps or settlements, and 1,512 were under observation and treatment. The distribution of leprosy in the Sudan is estimated as follows :—

PROVINCE.	In camps or settlements		Under observation and treatment as hospital outpatients	Total under treatment	Under observation	Estimated No. of further cases	Estimated total number of cases
	Segregated	Under treatment but not segregated					
Northern	—	—	52	52	—	—	52
Blue Nile	—	43	19	62	—	—	62
Kassala	—	26	—	26	—	—	26
Khartoum	—	—	34	34	—	—	34
Kordofan	—	—	419	419	42	1,500	1,961
Darfur	—	58	28	86	—	250	336
Port Sudan	—	—	1	1	—	—	1
White Nile	—	—	5	5	—	—	5
Upper Nile... ..	—	—	3	3	—	100	103
Bahr-el-Ghazal	—	78	—	78	237	—	315
Mongalla	390	2,103	951	3,444	3,972	400	7,816
	390	2,308	1,512	4,210	4,251	2,250	10,711

New leper settlements have been opened at Roseires in Blue Nile Province, and at Koggi in Mongalla Province west of the Nile near Juba.

Attempts are now being made to deal with the disease in all districts.

The Nuba Mountains area requires further attention but it has been impossible to do much during the last two years owing to the severe epidemic of cerebrospinal meningitis which has been raging there. It is intended to open voluntary settlements near dispensaries in 1936.

It is hoped that the economic development in this region will rapidly lead to a higher standard of living, which should be of assistance in dealing with this disease.

Mongalla Province, Li Rangu and Meridi Settlements.

Dr. Woodman, Senior Medical Inspector in charge of these settlements reports as follows :—

“ There are 1,225 lepers now in Li Rangu Settlement including 204 advanced cases in a segregated area. Apart from the latter, only 163 have continued treatment during 1935.

From January 1936 all treatment is being suspended for a period, except for cases recently admitted or re-admitted.

In addition to these 1,464 have been discharged during the last 4 years as quiescent, 951 of whom are still living within the confines of Li Rangu.

In the outside district there are 809 cases registered and periodically inspected, who have never been admitted to Li Rangu, or undergone treatment.

No cases other than those considered infective (*i.e.*, advancing C2 and C2-C3 cases) are admitted to the Settlement. Nearly all these outside cases therefore are very early N1 and C1 infections from whom only 24 have become active and infective and consequently admitted here during the year. The incidence of these early new cases continues unabated and is surprisingly high.

The population of one chief who has about 2,500 subjects showed an incidence of more than 1% new cases for 1935 alone. Yet only one infective case was admitted to the Settlement. Where these new cases get their infection and why they continue to increase remains a mystery. The majority remain absolutely stationary for years rendering the subject no inconvenience whatever.

Summarising the above figures, the total known lepers in Yambio and Li Rangu sub-district (excluding Meridi) is 3,498 or nearly 7% of the population, a figure far higher than that previously calculated.

Of the total, 2,689 have been at one time or another through the Li Rangu settlement in the last five years, the remaining 809 are known to exist in the district, untreated.

It would be misleading to compare tables 1 and 2 as an index to the efficacy of treatment, as those in table 1 consist of (a) cases who have continued treatment because of their persistent tendency to get worse, and (b) contains more than 50% relatively advanced cases.

A truer comparison of "controls" with those treated was given in the 1932 report, in which it was definitely shown that there was a balance in favour of treatment. This was after a two years campaign. The following tables, 2 and 3, show results as they occur after five years' observation.

Taking both tables together the following summary is of interest :

78% of all cases are either arrested or quiescent.

7.5% have improved.

12% are worse.

2.5% have cleared up altogether (*i.e.*, in the year 1935 and does not, of course, include those "cured" in preceding years).

There is no evidence in favour of treatment at this stage ; the percentage of those "worse" as well as those "improved" is greater among the treated. Of the 951 lepers previously discharged from treatment and living in Li Rangu Settlement :—

8% are completely cured.

9.8% are worse, of whom 4 are so much worse that they have been put back under treatment.

The remainder are entirely quiescent or arrested.

SUMMARY.

There is little to add to my notes in the 1934 report on the figures in these tables.

The stage has been reached where further treatment with chaulmoogra derivatives is of no avail, in so far as this applies to cases prior to 1933-34.

It is particularly worthy of note that, whereas in 1932, 31% of lepers had been rendered quiescent, by 1935 the percentage is 78.

A big proportion of early cases become arrested in any case, but is assisted to do so by treatment.

No form of treatment yet tried holds out much prospect for the advanced cutaneous and mixed cases. They have all undergone prolonged treatment, and the very few who have improved would have probably done so without interference. The most hopeful outlook for the majority of C3 cases who survive is the gloomy prospect of the maimed and disabled N2 stage.

Methylene blue has proved entirely disappointing in the advanced cases although possibly more effective than sodium gynocardate.

In spite of the great incidence of leprosy it is important to note (1) that less than 10% of cases are any danger to their neighbours as far as can be at present judged, in the absence of exhaustive and repeated laboratory examinations, (2) that treatment is effective and worth trying in a large percentage of active early cases over a period not exceeding four years, (3) that the settlements have removed the chief foci of infection in the district, and both centralized and simplified their control.

TABLE 1.

Analysis of Non-Segregated Relatively Early Cases Under Treatment.

Progress of Patients.	Total.	C.1	C.2	N.1	N.2	C1.N1	C1.N2	C2.N1	C2.N2
“ CURED ”	1	—	—	1	—	—	—	—	—
IMPROVED	18	2	5	3	1	2	1	2	2
QUIESCENT	66	12	12	5	8	6	5	9	9
ARRESTED...	15	10	2	—	—	1	—	2	—
WORSE ...	43	1	7	1	8	2	7	6	11
TOTAL ...	143	25	26	10	17	11	13	19	22

ARRESTED : being where the case has remained quiescent over a period of *three years*.

“ CURED : ” being where every visible sign of the disease has disappeared.

TABLE 2.

Analysis of Non-Segregated Early Cases not under Treatment.

Progress of Patients.	Total.	C.1	C.2	N.1	N.2	C1.N1	C1.N2	C2.N1	C2.N2
“ CURED ”	25	12	1	8	—	4	—	—	—
IMPROVED	55	13	19	9	2	8	—	2	2
QUIESCENT	308	96	72	43	40	21	9	15	12
ARRESTED	407	165	118	48	18	30	10	11	7
WORSE ...	83	8	16	6	27	4	5	5	12
TOTAL ...	878	294	266	114	87	67	24	33	33

TABLE 3.

Lepers Treated at Meridi Settlement.

Progress of Patients.			Early Cutaneous and “ Neural ”	Advanced Cutaneous	Advanced Mixed.	Advanced Neural.
IMPROVED	...	...	9%	1.5%	7%	7%
QUIESCENT	...	...	9%	—	4%	10%
ARRESTED	...	...	4.5%	—	—	1.3%
WORSE	...	...	4.5%	6%	19%	17%

There are now 81 cases in the Settlement.

The percentage is of the total number, indicating that roughly 46% are worse.

TABLE 4.

Analysis of Advanced Segregated Lepers Treated with Methylene Blue.

Progress of Patients.	Total.	C. 2	C2.N1	C. 3	C3.N1	N. 2	C1.N2	C2.N2	C3.N2
IMPROVED	13	—	—	—	2	1	1	4	5
QUIESCENT	22	1	—	1	4	3	1	2	10
WORSE ...	47	—	1	8	7	3	2	5	21
TOTAL	82	1	1	9	13	7	4	11	36

Intravenous injections were given commencing with 3 c.c. of 1% solution working up to 10 c.c. of 3% until 6 c.c. of 4% was reached in the course of one year.

TABLE 5.

Analysis of 197 outside Registered Early Cases not under Treatment and Observed as Controls in Meridi District.

PROGRESS OF PATIENTS.	TOTAL.	C. 1.	C. 2.	C. 1 N. 1.	N. 1.	“ GOOSE SKIN ” ALONE.
“ CURED ”	15	9	—	2	4	40
IMPROVED	13	8	1	1	3	5
QUIESCENT	59	35	14	1	9	43
ARRESTED	5	3	1	—	1	—
WORSE	14	10	2	—	2	3
TOTAL	106	65	18	4	19	91

The figures of the last column are not included in the first.

BAHR-EL-GHAZAL PROVINCE :—

Wau Settlement.

	Remaining 1-1-35	Admitted.	Discharged.	Died.	Remaining
Men	32	9	15	1	25
Women	24	7	17	3	11
Children	1	6	1	—	6
	57	22	33	4	42

Treatment with Methylene Blue was tried this year with little improvement.

A leprosy survey of the western district was carried out. 10,789 people were examined and 237 cases of leprosy were found, an incidence of nearly 2.2 %

No tribes seemed to be particularly affected and the distribution was fairly uniform.

DARFUR PROVINCE.

86 cases were under treatment during the year. 19 were discharged as cured and two died. The small leper colony at Zalingei has proved a success, and it is reported that all the patients improve under treatment.

NORTHERN SUDAN.

The incidence of the disease is low, and cases are treated as inpatients.

In Omdurman the Church Missionary Society hospital have 34 cases who attend for treatment, and whose home conditions are under supervision.

The British Empire Leprosy Relief Association have made a grant of £ 250 to build an outpatient treatment room at this hospital.

Cases which cannot be dealt with locally are sent to the leper colony at Gedaref, where there were eight admissions during the year.

MALARIA.

Despite the high Nile flood and with a badly spaced average rainfall, the incidence of malaria was low in the northern Sudan.

The sanitary organisation of the Northern and Khartoum Provinces has developed considerably in recent years, with the result that it is possible to deal effectively with the malarial problem in rural districts as well as in the towns. In the outlying districts the situation is not satisfactory, particularly in the southern part of Blue Nile Province and Darfur, and steps are being taken to remedy matters.

BLUE NILE PROVINCE.

Gezira. The disease is kept under control in this region, although, of course, the incidence of chronic malaria is—and has always been—high.

The development of a network of 47 dispensaries, with two parent hospitals, has eliminated the epidemics of acute malaria which used to rage, with heavy loss of life, before the country was irrigated.

Taking the spleen rate in children as an index of endemicity, there has been a considerable improvement in recent years. School-boys in the village schools of the Gezira are examined in January, June, September and November every year. The following table shows the results of these examinations since September, 1933 :—

				Month.	Examined	No. found.	Percentage
1933	...	...	...	September	3,284	1,434	44
1933	...	...	...	November	4,261	1,742	41
1934	...	...	...	January	4,271	1,671	38
1934	...	...	...	June	4,117	1,611	39
1934	...	...	...	September	4,018	1,496	37
1934	...	...	...	November	4,986	1,804	36
1935	...	...	...	January	4,036	1,410	34.9
1935	...	...	...	June	2,616	825	31.5
1935	...	...	...	September	2,533	754	29.8
1935	...	...	...	November	3,460	967	27.9
1936	...	...	...	January	3,632	1,037	28.5

Singa District.

The incidence was considerably increased owing to an exceptionally high river flood in two successive years.

KASSALA PROVINCE.

The result of anti-mosquito measures taken during the last two years is reflected in a marked reduction in the incidence of malaria. 386 cases were admitted to hospital compared with 506 in 1934, and 697 in 1933. It is hoped that it will be possible to carry out further improvement in the surface drainage of the town before the next rainy season. A disquieting feature in the situation is that the proportion of malignant to benign malaria is increasing.

KORDOFAN PROVINCE.

The incidence of malaria has decreased during the last few years over the province as a whole, with the exception of Talodi and Muglad where it has risen. In El Obeid, where a considerable improvement in sanitation has been effected, the decrease is particularly marked. The number of outpatient attendances for malaria was 1218 in 1935 compared with 2412 in 1934 and 4862 in 1933.

NORTHERN PROVINCE.

Special efforts have been made to organise a complete anti-malarial service in the southern half of this province. The number of dispensaries has been increased, and the anti-mosquito brigades strengthened.

It is satisfactory to record a marked fall in incidence as shown by the recorded attendances from 24,327 in 1933, to 19,002 in 1934, and 9,428 in 1935, despite the fact that the increase in the number of dispensaries would result in a higher proportion of the total number of cases being reported.

GENERAL.

No epidemic of malaria has occurred in the northern or central Sudan in recent years.

Formerly, epidemics used to sweep over the country at frequent intervals, with heavy loss of life. It appears that the anti-malarial organisation is efficient enough to prevent them under normal circumstances.

Chronic malaria is still prevalent, but the situation in this respect improves steadily year by year. Improved standards of living and sanitation are important factors in effecting this.

In the south, the heavy rainfall, innumerable rivers, extensive marshes and the immense area make the problem insoluble, except in restricted areas. Fortunately, the local inhabitants have considerable immunity.

On the whole, the situation as regards this disease over the whole Sudan is as satisfactory as can be expected.

The following table shows the percentages of identified benign, malignant and quartan malaria, in certain districts and towns :—

PROVINCE.		Station.	% Malignant Tertian.	% Benign Tertian.	% Quartan
NORTHERN	...	Wadi Halfa	26.3	73.7	—
		Merowe	83.4	16.6	—
		Atbara	34.7	64.0	1.3
BLUE NILE	...	Wad Medani	63.5	32.8	3.7
		Abu Usher	65.3	34.7	—
		Sennar	79.4	17.1	3.5
		Singa	80.6	19.4	—
		Roseires	52.4	46.9	0.7
DARFUR	...	El Fasher	21.6	78.3	0.1
		Geneina	68.0	32.0	—
KASSALA	...	Kassala	40.6	58.7	0.7
		Gedaref	10.6	89.3	0.1
KORDOFAN	...	El Obeid	37.3	49.5	13.2
		Kadugli	54.5	42.7	2.8
		Dilling	53.7	46.3	—
		Talodi	40.0	60.0	—
KHARTOUM	...	Khartoum	63.6	34.4	2.0
		Khartoum	59.5	38.3	2.2
		British Troops			
		Omdurman	73.8	26.2	—
		Gebel Aulia	66.0	28.7	5.3
PORT SUDAN	...	Port Sudan	59.4	29.0	11.6
WHITE NILE	...	Dueim	59.0	41.0	—
		Kosti	7.0	93.0	—
UPPER NILE	...	Malakal	90.3	3.0	6.7
EQUATORIAL	...	Juba	82.6	17.4	—
		Yei	50.0	50.0	—
		Torit	68.4	31.6	—
		Kapoeta	97.7	2.3	—
		Li Rangu	75.0	25.0	—
		Tembura	59.2	40.8	—
		Wau	78.5	21.5	—
		Rumbek	56.0	36.8	7.2

RABIES.

The incidence of this disease is increasing and it is now endemic in all parts of the Sudan except the Dongola and Wadi Halfa districts of the Northern Province.

10 human cases were reported compared with 8 in 1934.

290 persons received antirabic treatment of whom four died, compared with 198 with six deaths in 1934.

Details of the four fatal cases were as follows :—

- (1) A boy died 30 days after being bitten, having received 8 injections.
- (2) A woman died after a full course of injections, the first of which was given 12 hours after the bite.
- (3) A man died 70 days after having been bitten. He received 7 injections but ran away from hospital, dying 54 days later.
- (4) A man died, after a full course of injections, 33 days after having been bitten.

In addition three persons died of rabies in hospital before treatment could be given, and three deaths were reported in persons who did not report for treatment.

It is impossible to eradicate the disease owing to the fact that wild animals form a reservoir, and it is difficult to keep the towns free from it as infection is often introduced from the rural districts even if the most stringent measures are taken in the towns themselves.

The Arab sheep dog is indispensable to his master and wanders with him far and wide through the country. Under the circumstances all that can be done is to destroy all stray dogs, and hyenas, jackals etc. as far as possible and provide facilities for treatment for those who are unfortunate enough to be bitten.

Even indiscriminate destruction of dogs has its danger, as, in several villages, where the population destroyed most of their dogs, the hyenas became so bold that they entered the villages and dragged people off their beds at night, mauling them before their friends could intervene.

ACUTE RHEUMATISM.

361 cases with four deaths were reported as against 374 cases with no deaths in 1934.

The distribution of the cases was :—

PROVINCE.	Cases.			PROVINCE.	Cases.		
Bahr-el-Ghazal	18	Khartoum	...	...	40
Blue Nile	47	Kordofan	...	...	40
Darfur	40	Mongalla	...	...	66
Kassala	46	Upper Nile	...	...	10
Northern	54				

SCURVY.

56 cases were reported with one death.

SCHISTOSOMIASIS.

The position remains satisfactory as regards this disease. In the Northern Province it is being dealt with effectively, and has ceased to be of public health importance in many districts where it was a menace ten years ago.

Every precaution has been taken to prevent the disease invading the perennially irrigated area of the Gezira, where it would be disastrous if it became endemic.

The incidence in this area has always been negligible, and the result of the survey carried out this year is more satisfactory than that of any survey since irrigation commenced, except for the exceptionally low figure in 1934. The disease is probably less prevalent than it was before the land came under irrigation.

The areas infected with rectal bilharziasis in the White Nile Province are being successfully dealt with by providing a protected water supply from wells instead of from the river.

In Kordofan and Darfur Provinces, where the disease is of little importance, adequate facilities for treatment have been provided for those who consider the disease worse than the treatment.

NORTHERN PROVINCE.

Dongola and Merowe Districts : (*Schistosoma haematobium*). A yearly bilharzia survey is carried out in these districts, and the comparative figures for the last ten years are :—

YEAR.						Number examined.	Infections found.	Percentage.
1926	...	...	...	...	...	20,400	3,550	17.0
1927	...	...	...	...	...	11,376	1,829	16.0
1928	...	...	...	...	...	12,213	2,259	18.0
1929	...	...	...	...	...	17,925	2,187	12.0
1930	...	...	...	...	...	26,094	2,443	9.3
1931	...	...	...	...	...	37,405	1,765	4.6
1932	...	...	...	...	...	49,077	2,470	5.0
1933	...	...	...	...	...	58,711	1,825	3.1
1934	...	...	...	...	...	46,054	1,768	3.8
1935	...	...	...	...	...	40,950	1,408	3.4

Wadi Halfa District (*Schistosoma haematobium*).

A bilharzia survey was carried out over the whole district, with the following results compared with 1934 :—

YEAR.			Number examined.	Infections found.	Percentage.	Number treated.
1934	...	...	20,180	3,927	19.46	3,501
1935	...	...	12,076	2,613	21.6	1,982

Berber and Shendi Districts (*Schistosoma haematobium*).

The incidence of this disease shows a diminution in the areas where it is endemic, and there is no evidence of spread of the disease beyond these areas. The number of cases under treatment was 658, compared with 1,016 in 1934. This is attributed to the special efforts made against this disease in the Abidia and Zeidab districts.

Shendi District (*Schistosoma mansoni*)

A small focus was discovered and dealt with at the end of 1934 in the irrigated area of Zeidab. It has been noted that the distribution in villages in this area was by no means uniform, and was most marked in those villages which were situated near the surrounding canals, or near the dead-ends of canals.

BLUE NILE PROVINCE (*Schistosoma haematobium*).

Gezira Area. The yearly survey showed that the incidence of the disease was less than at any time since the area came under perennial cultivation, with the exception of the very low figures in 1934.

The following figures show that the various precautionary measures have kept the disease under control todate :—

Indigenous Population Only.

YEAR.	ADULTS.			CHILDREN.			TOTAL.		
	No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%
1926	16,419	76	0.47	—	—	—	16,419	76	0.47
1929	—	—	—	2,341	37	1.60	2,341	37	1.60
1930	—	—	—	3,322	20	0.57	3,322	20	0.57
1931	11,102	84	0.75	6,895	51	0.74	17,997	135	0.75
1932	9,618	51	0.53	1,707	19	1.10	11,325	70	0.62
1933	14,188	28	0.20	3,288	27	0.82	17,476	55	0.31
1934	12,769	5	0.04	3,583	2	0.07	16,352	7	0.04
1935	13,902	8	0.06	2,945	12	0.40	16,847	20	0.12

(The figures shown for 1934 in the last report were incomplete. Similarly, those shown for 1935 are incomplete, as the survey has not yet been concluded).

The prophylactic measures taken include :—

- (1) Examination of urine, in dispensaries and hospitals, of every patient presenting himself, and treatment where necessary ; 55,757 persons were examined in 1935.
- (2) An annual examination, and treatment of the population in the cultivated areas, by field units.
- (3) Destruction of molluscs by disinfectant in all canals adjacent to villages where cases have occurred among the resident population, in which infected molluscs have been found.
- (4) Installation of pit-latrines in villages ; 21 public latrines of various sizes have been constructed this year. 102 villages have been provided with public latrines during the last four years.
- (5) Re-siting of villages at least 300 metres from a canal ; over one hundred villages have been re-sited during the last two years.
- (6) Provision of village wells as an alternative water supply to canals.
- (7) Widespread propaganda.

Singa District (*Schistosoma haematobium*).

A small focus of infection was discovered at the village of Dar Agil in 1933 caused by an infected backwater of the river, which only exists at high Nile.

A dispensary was opened here, and treatment arranged. No other preventive measures were taken.

It is of interest to record that the disease has completely died out as a result.

WHITE NILE PROVINCE (*Schistosoma mansoni*).

The incidence has been considerably reduced during the last ten years.

The following preventive measures are taken :—

- (1) Provision of wells in villages adjacent to the river to provide an alternative water supply. Seven wells were constructed in 1935.
- (2) Provision of special watering and washing places on the river bank.
- (3) Propaganda.

The following table shows the percentage of rectal bilharzia among school children :—

YEAR.					Dueim.	Kawa.	Geteima.	Aba Island.
1926	...	...	...	...	93	100	90	54
1930	...	...	...	...	25	24	47	14
1931	...	...	...	...	18.3	16	17.3	9
1932	...	...	...	...	13.0	14	13.3	2.4
1933	...	...	...	...	9.4	—	0.5	6.8
1934	...	...	...	...	13.3	—	—	11.3
1935	...	...	...	...	6.1	—	0.6	8.2

A focus of *Schistosoma haematobium* occurs east of the river at Abu Duloh, due to the infection of shallow rain-water pools. The provision of proper wells in 1934 led to a marked decrease in the incidence of the disease.

					No. Examined	No. Infected.
December, 1934	...	...	...	...	337	263
December, 1935	...	...	...	...	270	70

KORDOFAN AND DARFUR PROVINCES : *Schistosoma haematobium* is endemic in these provinces.

It is not considered necessary to take special measures. The disease is unusually mild, disappears on reaching adult age, and is of no public health importance.

Facilities for treatment are provided.

BAHR EL GHAZAL PROVINCE.

Schistosoma mansoni has been discovered recently in this province through routine examination of stools. The disease is mild and causes no symptoms in the great majority of cases.

SLEEPING SICKNESS.

92 cases were reported, compared with 32 in 1934 and 83 in 1933.

MONGALLA PROVINCE.

The total number of cases reported was 91 compared with 22 in 1934 and 82 in 1933.

The following list shows the number of cases since 1918 :—

YEAR.			Tembura.	Yei.	Kajo-Kaji.	Nimule.	Yambio.
1918	...	...	255	32	42	2	—
1919	...	...	621	15	63	8	—
1920	...	...	192	32	54	2	—
1921	...	...	656	24	31	12	—
1922	...	...	434	7	68	35	—
1923	...	...	839	3	5	4	4
1924	...	...	276	—	82	9	14
1925	...	...	203	—	10	9	—
1926	...	...	79	—	3	—	—
1927	...	...	49	1	—	18	3
1928	...	...	26	1	—	—	2
1929	...	...	18	—	—	—	—
1930	...	...	37	—	—	—	1
1931	...	...	61	—	—	—	1
1932	...	...	49	—	—	—	14
1933	...	...	70	1	—	—	12
1934	...	...	20	4*	6†	—	2
1935	...	...	80	1	10	—	—

* 3 contracted in Belgian Congo— † Infected in Uganda.

No cases were reported from south of Yambio during the year, where there had been a small focus of infection during the previous three years.

Many cases continue to occur near Tembura, the greater number in the Renzi central area, which has supplied most of the cases during the last three years. It has been found impossible to eliminate the disease from this district, but it is hoped that it will be possible to avoid any serious outbreak by maintaining the preventive measures which are at present enforced.

The cases reported during the year from Yei and Kajo-Kaji originated from epidemics in neighbouring countries, close to our frontier.

In Kajo-Kaji the local fly have become infected along one water-course, and the people living there have been moved to another district.

It is anticipated that the incidence will increase, owing to the recent heavy traffic across the frontier, which it is impossible to prevent.

It is hoped that, by regular inspection of the population, clearance of river banks, and careful siting of villages, cases will be reported early, and any outbreak controlled at once.

BAHR-EL-GHAZAL.

One case, probably infected elsewhere, was reported from the Wau-Meshra Road.

GENERAL.

A system of passes is being arranged for natives in sleeping sickness districts, along the frontier, east of the Nile, who wish to visit Uganda. As far as the Sudan is concerned, this is an experiment to find out whether it will not be more satisfactory to control the movement than to prohibit it, as experience has shown that prohibition can only be partially enforced.

SYPHILIS AND YAWS.

The incidence of yaws remains negligible.

There is no evidence of any change in the incidence of syphilis except that a decrease is reported from Darfur and an increase from Omdurman.

Investigations carried out by the Government Obstetrician shew that the incidence of syphilis in pregnant women is not high, and is not a common cause of abortion, as the following table indicates:—

Total number of cases	Kahn tested.	Negative.	Positive.
126	106	96	10

i.e., 9.4% of pregnant women shew a positive Kahn reaction.

In cases of abortion the figures were:—

Total number of cases.	Kahn tested.	Negative.	Positive.
42	36	33	3

TUBERCULOSIS.

872 cases were admitted to hospital of whom 501 were pulmonary and 371 non-pulmonary.

The Northern Province and Kassala Province show the highest incidence. Domestic servants who have contracted tuberculosis in Egypt, return to the Northern Province to die, and starving Abyssinians who invade Kassala Province in search of work, are particularly susceptible to the disease.

The situation is fairly satisfactory in the northern Sudan, where it is expected that the steady improvement in the standard of living which is taking place, will increase the existing immunity of the inhabitants.

In the south, where the disease has been introduced among a non-immune population by contact with civilisation, the situation gives rise to anxiety and requires careful observation.

56 of the pulmonary cases were foreigners, and 13 were Sudanese who contracted the disease in Egypt.

The nationality of foreigners affected was as follows :—

					Pulmonary.	Non-Pulmonary.
					<hr/>	<hr/>
West Africans	...	...	...	...	15	13
Abyssinians	...	...	...	...	6	3
Eritreans	...	...	...	...	12	5
Yemenis	...	...	...	...	8	—
Somalis	...	...	...	...	3	1
Kurdis	...	...	...	...	1	—
Egyptians	...	...	...	...	4	—
Greeks	...	...	...	...	4	1
British	...	...	...	...	3	—
					<hr/>	<hr/>
					56	23
					<hr/>	<hr/>

The following table shows the admissions and percentage rate of tuberculosis to other admissions for the northern and southern Sudan for the last four years :—

	1932		1933		1934		1935	
	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.
NORTHERN SUDAN.								
Admissions for TB	380	228	419	352	452	343	415	302
Total admissions	42,007		49,104		57,003		58,445	
%TB to total Adms.	0.90	0.54	0.85	0.72	0.79	0.60	0.71	0.51
	1.44		1.57		1.39		1.22	
SOUTHERN SUDAN.								
Admissions for TB	41	53	102	42	105	94	86	69
Total Admissions...	17,635		21,211		28,987		30,638	
%TB to total Adms.	0.23	0.30	0.48	0.20	0.36	0.32	0.28	0.22
	0.53		0.68		0.68		0.50	

The following table shows the admissions for pulmonary and non-pulmonary tuberculosis since 1922 and the percentage rate of tubereulosis cases to other admissions :—

YEAR.	Pulmonary.		Non-Pulmonary.		Total.	
	Admissions.	Percentage.	Admissions.	Percentage.	Admissions.	Percentage.
1922 ...	140	0.82	94	0.56	234	1.38
1923 ...	123	0.72	128	0.74	251	1.46
1924 ...	159	0.80	131	0.66	290	1.46
1925 ...	135	0.62	157	0.84	292	1.46
1926 ...	175	0.80	196	0.91	371	1.71
1927 ...	226	0.86	178	0.69	404	1.55
1928 ...	260	0.82	327	0.75	497	1.57
1929 ...	302	0.65	322	0.70	624	1.35
1930 ...	480	0.95	300	0.61	780	1.56
1931 ...	390	0.65	294	0.49	684	1.14
1932 ...	421	0.70	281	0.47	702	1.17
1933 ...	521	0.74	394	0.56	915	1.30
1934 ...	557	0.65	437	0.50	994	1.15
1935 ...	501	0.56	371	0.42	872	0.98

Comparative table shewing the occupation of persons affected with pulmonary tuberculosis in the northern Sudan during the last four years :—

OCCUPATION.			Cultivators	Nomads	Soldiers & Police	Day Labourers	Townsmen	Women not employed	Unknown or of no occupation	Children	Total
1932	...	...	87	8	12	66	94	41	72	—	380
1933	...	...	116	22	17	46	105	60	53	—	419
1934	...	...	124	25	5	57	110	79	47	5	452
1935	...	...	113	15	9	43	94	87	51	3	415

Age Incidence.

The following table compares the age group incidence of cases and deaths of pulmonary tuberculosis over the last four years :—

		Under 1		1-10		10-20		20-30		30-40		40-50		50-60		Over 60		Undefined.	
		C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D
Northern Sudan	1932	1	1	4	—	46	11	159	38	88	22	47	18	20	4	15	7	4	—
	1933	—	—	5	1	37	6	160	33	119	32	53	12	35	10	8	4	2	1
	1934	—	—	5	2	25	—	147	24	111	22	44	8	30	7	12	3	81	4
	1935	—	—	3	—	28	5	154	30	131	26	55	11	25	7	17	2	2	2
Southern Sudan	1932	—	—	—	—	4	1	12	2	11	1	5	1	—	—	1	—	8	1
	1933	—	—	1	—	17	1	24	1	22	2	9	1	2	1	1	—	28	8
	1934	—	—	8	—	8	—	33	6	35	4	9	1	4	—	—	—	5	—
	1935	—	—	—	—	12	2	27	5	21	3	4	—	2	—	1	—	19	3

Incidence Among School Children.

No cases were found during the routine examination of 25,906 school-children.

TUMOURS.

653 cases were admitted, classified as follows :—

Malignant	{	Carcinoma	75						
		Sarcoma	43	...	...	...	...	169	
		Unclassified	51						
Benign	...	...	...	...	...	..	...	...	484

The following are the comparative figures for the northern and southern Sudan, shown as percentage of total admissions for the past four years :—

	1932		1933		1934		1935	
	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.
NORTHERN SUDAN. Admissions for new growths	141	295	163	363	145	338	137	328
Total Admissions...	42,007		49,104		57,003		58,445	
% total admissions	0.33	0.70	0.33	0.74	0.25	0.59	0.23	0.56
SOUTHERN SUDAN. Admissions for new growths	16	165	20	113	21	122	32	156
Total Admissions ...	17,635		21,211		28,987		30,638	
% total admissions	0.09	0.93	0.09	0.53	0.07	0.42	0.10	0.51

The race incidence for malignant growths was as follows :—

Arab	...	...	...	...	...	...	...	47.3%
Negroid	...	...	...	...	...	...	...	23.6%
Others	...	...	...	...	...	...	...	29.1%

TYPHOID FEVER.

246 cases of typhoid and paratyphoid fevers were reported with 36 deaths.

Cases reported since 1927 are as follows :—

	Cases.
1927	52
1928	132
1929	86
1930	73
1931	100
1932	85
1933	204
1934	188
1935	246

Khartoum Province accounts for the increased incidence with 175 cases compared with 101 in 1934. Khartoum shows an increase of 53 cases, and Khartoum North of 17, but Omdurman shows little change.

There is evidence to show that this disease has been introduced into the Sudan within recent times by human carriers, and Khartoum and Omdurman have always been particularly exposed to risk of infection owing to their contact with countries outside the Sudan.

UNDULANT FEVER.

28 cases, with 2 deaths, were reported in 1935, compared with 51 cases in 1934, and 25 in 1933.

The distribution for the past five years is as follows :—

							1931	1932	1933	1934	1935
							—	—	—	—	—
Berber	...	...	...	...	...	...	—	—	—	1	—
Blue Nile		...	...	...	...	...	10	10	6	17	2
Darfur	...	...	...	...	...	...	—	—	7	7	1
Fung	...	...	...	...	...	...	—	1	—	—	8
Kassala	...	...	...	...	...	...	11	8	10	21	12
Khartoum		...	...	...	...	...	2	2	1	—	1
Port Sudan		...	...	...	...	...	1	3	1	—	—
Mongalla	...	...	...	...	...	...	—	—	—	2	2
Upper Nile		...	...	...	...	...	—	1	—	1	2
White Nile		...	...	...	...	...	1	1	—	2	—
							—	—	—	—	—
TOTAL			...	...	...	...	25	26	25	51	28

PUBLIC HEALTH AND HYGIENE.

BY MR. H. A. CROUCH.

GENERAL REMARKS.

Meteorology. The rainfall in the northern Sudan was not above the average, but the rains were badly spaced and, in some places, considerable effort was required to deal with the resulting storm water.

The Nile reached an abnormally high level, even exceeding that of 1934, but the rise of the river was comparatively steady and no serious flooding occurred.

General Sanitation. The extension and improvement of the sanitation of towns has been maintained.

Where conditions are favourable the policy of replacing the more expensive bucket system by pit latrines has been continued.

Faultily constructed pit latrines have been closed and replaced by those of an approved pattern.

With a view to diminishing fly-breeding, special attention has been paid to the cleanliness of compounds and the control of domestic animals.

Anti-mosquito work has been extended. A survey of the distribution and incidence of *Aedes Aegypti* is being carried out in all the larger towns. All houses and public buildings are inspected weekly.

A beginning has been made in dealing with the much more difficult problem of village sanitation. Most villages in the Sudan are a muddled mass of houses swarming with flies.

In the Blue Nile Province, where whole villages have had to be moved, the opportunity has been taken to settle the inhabitants in orderly, simply designed villages, giving access to light and air, and under such conditions of cleanliness as can be reasonably maintained.

Elsewhere, orders have been issued that no new house or hut may be built unless its type and siting has been approved. Some improvement has been achieved by propaganda amongst chiefs and headmen. Success ultimately depends on their efforts to bring home to the individual householder his responsibility for the cleanliness of his house and its surroundings.

Water Supplies. No purification plants or piped water supplies have been installed during the year.

Plans are under consideration for schemes at Wadi Halfa and Malakal.

During the year a series of experiments were carried out by the Assistant Director, Laboratory Services, to test the value of chloramine in the sterilization of well water. Four wells in the native quarter of Khartoum were selected. The Chloramines were formed by adding equal amounts of the trade preparation “ chlorosene ” and ammonium chloride. It was found that dilution of 1 in 225,000 of Chlorosene completely sterilized the water within an hour, and it remained so for 3—4 hours. With dilution of 1 in 112,000 the water was still sterile after 7 hours.

The method may have considerable practical value in certain cases.

Sanitary Control of Aircraft. The staffing and sanitary equipment of all aerodromes has been completed during the year.

All aircraft arriving at, and making their final departure from, frontier aerodromes are inspected for mosquitoes and disinfected. As a further precaution, these measures are repeated in all aircraft on arrival in Khartoum.

The following mosquito inspections of aircraft were carried out during the year :—

Wadi Halfa	...	...	...	...	...	...	...	347
Juba	...	...	...	...	...	...	...	346
Malakal	...	...	...	...	...	...	...	275
Kassala	...	...	...	...	...	...	...	105
Khartoum	...	...	...	...	...	...	...	321
								<hr/> 1,394

During the year experiments have been carried out on a number of insecticides to determine their lethal effect on mosquitoes and the period of exposure required. In the case of aircraft insecticides, various ingredients were added to render them non-inflammable and, at the same time, retain their potency. These investigations are being continued.

Nutrition. During the year a schedule was prepared showing the approximate values of locally grown and imported foodstuffs. This schedule accompanied by certain general recommendations based on the values given, was widely circulated to medical and administrative officials throughout the country. Up to the present time, no analysis of Sudan foods has been carried out and the values referred to above were obtained from work done in other countries. The figures, therefore, have little value except as averages, but they demonstrate certain general principles and serve as a rough guide to agriculturists and others as to which crops should be encouraged and which are less important from the nutritional point of view.

In southern Kordofan, where evidence is accumulating to show that subnutrition is widespread, persistent propaganda relating to the advisability of growing fruits, vegetables and lucerne has been widely disseminated to all British and native officials. The Medical Inspector drew attention to the importance of encouraging the small yellow-grained crops and of discouraging the cultivation of maize, the need for more irrigation by water-wheel and for dry season greenery. All hospitals and dispensaries in this area now have gardens, and the importance of gardening and dietetic reform is emphasized in daily lectures given to the hospital staffs.

In the Blue Nile Province, the Senior Medical Inspector reports that shade trees have been planted in a number of villages and that there are some good fruit and vegetable gardens in the villages, and vegetable plots in the cultivations. This is a great improvement which should be given every help and encouragement.

HEALTH ORGANISATION

British Sanitary Inspectors. As last year, there are 15 British sanitary inspectors posted as follows :—

Khartoum	4	Blue Nile Province	5
Gebel Aulia	1	Port Sudan	1
Omdurman	2	Northern Province	2

The appointment of Sudanese sanitary officers and the reorganisation of this branch of the service has enabled one British sanitary inspector from headquarters to remain constantly on tour. During the past year all provinces where British sanitary staff is not permanently stationed, have been visited on one or more occasions. A complete survey of existing sanitary arrangements has been made, staffs reorganised, and a programme of improvements prepared. This work should prove of immense benefit to the public health in the more remote parts of the Sudan.

Sudanese Sanitary Officers. The course of training for sanitary officers was approved by the Royal Sanitary Institute at the beginning of the year. The qualifying examination is conducted under their supervision. Successful candidates are awarded the diploma of the Institute and are eligible to become associate members.

Two candidates sat for the first examination held in January ; both were successful. Two further students completed the full course, and three the first year of training in the public health service.

This new cadre of Sudanese officials has already proved its value.

Sanitary Overseers. In the past these officials were trained locally and paid by the local authority, with the result that there was no universal standard of training and efficiency laid down and maintained.

In 1935 arrangements were made that all sanitary overseers should be paid by the Medical Service and that no man should be appointed who had not reached a satisfactory standard of general education, and until he had undergone a course of instruction in Khartoum and passed a qualifying examination.

Sanitary overseers already appointed who have not been trained at Khartoum are given a revision course and are required to pass the same examination before transfer to the Medical Service.

Dispensary Staff. In outlying districts where no sanitary personnel is available, it is important that the staff of the local dispensary should have some knowledge of the elementary principles of hygiene and sanitation. In the course of training for assistant medical officers provision has been made for a course of lectures in general sanitation and mosquito work. Similar arrangements have been made at provincial hospitals for the instruction of dispensary staff already posted.

THE HEALTH AND SANITATION OF TOWNS.

(a) KHARTOUM PROVINCE.

GENERAL.

The public health of the province during 1935 was maintained at a generally satisfactory standard. The prices of the principal foodstuffs continued low, and there was some improvement in commercial conditions.

There was no extensive outbreak of epidemic disease. Five sporadic cases of cerebrospinal meningitis were notified during the year. The incidence of the zymotic diseases appeared considerably less than in 1934.

Of the endemic diseases there was a further considerable rise in the number of cases of enteric fever. The notifications of amoebic dysentery and tuberculosis were also somewhat more than in the previous year. The incidence of malaria remained low, although there was a sharp peak in the number of primary infections reported during December.

Further progress was made in clearing insanitary areas in the town, and in dealing with the problem of overcrowding. Considerable improvement was achieved in village sanitation throughout the rural district.

The school medical service and maternal and child welfare clinics continued to function satisfactorily during the year, and it was possible to extend slightly the scope of these services.

POPULATION.

The population of the province was estimated, mainly by the inhabited house method, as 271,870.

The following table shows the estimated population of each locality :—

	Men.	Women.	Children.	Total.
Khartoum	16,817	14,626	17,218	48,661
Khartoum North	6,908	7,506	8,825	23,239
Omdurman	27,717	36,883	47,276	111,876
Gebel Aulia	5,740	756	670	7,166
Rest of Rural District	20,597	26,429	33,902	80,928
TOTAL	77,779	86,200	107,891	271,870

Of the above the following were non-natives of the Sudan :—

	Men.	Women.	Children.	Total.
Khartoum	2,812	2,152	2,177	7,141
Khartoum North	314	225	372	911
Omdurman	693	454	695	1,842
Gebel Aulia	2,586	206	120	2,912
Rest of Rural District	834	79	233	1,146
TOTAL	7,239	3,116	3,597	13,952

BIRTHS AND DEATHS.

4,192 births and 2,100 deaths were registered during the year, an excess of births over deaths of 2,092. Births showed an increase of 137 and deaths a decrease of 392 as compared with the figures for 1934.

The figures from the rural district correspond closely with those of the previous year, and, while the whole of the district is not as yet covered by the births and deaths registry organization, the figures can probably be regarded as fairly accurate for a considerable proportion of the population of this area.

Deaths by age :—

Age Period	0-1	1-5	5-10	10-20	20-40	40-60	Over 60.
Deaths ...	234	233	77	92	384	254	826
TOTAL ...	...	...	...	...	2,100		

ANALYSIS OF THE CAUSES OF DEATH.

The following table is the result of an analysis of the cause of death in 634 cases certified by qualified medical practitioners. Certification of death, even by medical practitioners, is not yet satisfactory. Registration is carried out by Arabic-speaking officials and a certain amount of difficulty arises from the

translation of scientific terms into this language. It is hoped that the use of the International Nomenclature List of diseases may serve to clear much of the difficulty :—

CAUSE OF DEATH BY AGES.

CAUSE OF DEATH.	AGE PERIODS.										TOTAL.
	0—1	1—5	5—15	15—20	20—30	30—40	40—50	50—60	Over 60	Over 70	
Pneumonia & Respiratory disease (non-tubercular.) ...	13	13	11	3	17	15	13	16	13	14	128
Cardiac disease ...	2	1	2	1	6	9	14	12	11	21	79
Diarrhoea, Enteritis, Dysentery ...	22	11	3	—	10	8	2	7	6	5	74
Violence (all forms) ...	1	5	10	5	13	15	2	4	4	5	64
Genito-urinary disease and Uraemia ...	—	—	1	—	4	9	1	8	7	15	45
Pulmonary tuberculosis	—	—	—	1	9	13	1	3	2	—	29
Septicaemia (all forms) non-puerperal ...	—	3	1	—	4	4	3	1	5	3	24
Fever, Malaria and Blackwater fever ...	1	4	1	—	6	5	2	1	1	1	22
Enteric fever ...	—	1	8	2	8	—	1	—	—	—	20
Old age... ...	—	—	—	—	—	—	—	—	3	13	16
Meningitis ...	2	5	1	—	5	2	—	—	—	—	15
Childbirth ...	—	—	—	2	6	5	1	—	—	—	14
Cerebral haemorrhage & thrombosis ...	—	—	—	—	—	1	2	3	4	3	13
Non-pulmonary tuberculosis ...	—	—	6	1	2	—	—	1	1	—	11
Hepatic disease ...	—	—	—	—	4	2	2	—	1	2	11
Cancer ...	—	—	—	—	2	—	2	1	—	5	10
Syphilis ...	5	1	1	—	—	1	1	1	—	—	10
Acute abdominal disease ...	—	—	—	—	2	4	1	1	1	—	9
Kala-azar ...	—	—	—	—	5	3	1	—	—	—	9
Other causes ...	5	3	1	2	9	4	2	2	1	2	31
TOTAL ...	51	47	46	17	112	100	51	61	60	89	634

COMMUNICABLE DISEASES.

No epidemic of note occurred during the year. Only five sporadic cases of cerebrospinal meningitis were notified and there was no case of small pox or relapsing fever.

There was a considerable increase in the number of cases of enteric fever and a slight rise in the incidence of amoebic dysentery. The increased incidence of enteric fever occurred mainly in the native lodging area of Khartoum and in Khartoum North.

52 cases of primary locally contracted malaria were notified as compared with 57 in 1934 and 191 in 1933.

The more important of the communicable diseases are dealt with at greater length under their respective headings.

COMMUNICABLE DISEASES

SHOWING NUMBER OF CASES NOTIFIED AND PLACE.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chickenpox ...	18	19	36	73	2	4	—	79
Diphtheria ...	10	6	2	18	2	3	—	23
Cerebrospinal Meningitis ...	2	—	—	2	3	—	—	5
Amoebic Dysentery	2	1	63	66	125	179	106	476
Bacillary Dysentery	12	3	1	16	1	1	11	29
Enteric fever ...	53	19	81	153	9	13	—	175
Leprosy ...	1	—	7	8	2	12	—	22
Malaria ...	35	4	13	*52	1,226	667	191	2,136
Measles ...	3	3	4	10	1	—	—	11
Mumps ...	12	—	3	15	4	—	—	19
Soft Sore ...	64	5	6	75	18	—	—	93
Syphilis ...	62	21	274	357	359	73	—	789
Pulmonary T.B. ...	17	4	33	54	9	41	—	104
Non-Pulmonary T.B.	14	10	15	39	5	17	—	61

* Excluding British troops.

MALARIA.

225.9 mms. of rain fell during the year. The bulk of fall occurred during August and considerable effort was demanded in order to deal with the resulting standing water.

The Nile reached an abnormally high level, even exceeding that of 1934. The rise and fall of the river however, were comparatively steady and no unusual difficulty was experienced in controlling the mosquito breeding in pools on the foreshore.

2,136 cases of malaria were reported during the year as compared with 2,290 in 1934. Of these cases 52 were apparently primary infections contracted in the three towns. 1,226 were from the rural district, 191 were considered relapsed cases. 667 were imported from outside the province. Apart from imported cases, all figures show a decrease compared with the previous year.

The continued low incidence of malaria is satisfactory, and, although a term of years will be necessary to assess correctly the efficiency of the increased measures of control recently instituted, it is hoped that these measures, and not some unexplained natural factor, are in part responsible for the lowered incidence.

The following table shows the incidence of primary cases of malaria by nationality, age and types of parasite :—

By Nationality :

British ...	(excluding British Troops. )	...	...	...	23
Sudanese	...	...	...	...	26
Others	...	...	...	...	3
					<hr/> 52 <hr/>

By Age :

Age Period.	0-5	5-10	10-20	20-30	30-40	40-50
<hr/> Cases	<hr/> 5	<hr/> 6	<hr/> 9	<hr/> 21	<hr/> 10	<hr/> 1

Types of Parasite :

Malignant tertian	...	...	...	...	...	...	30
Benign tertian...	...	...	...	...	...	...	16
Quartan	...	...	...	...	...	...	1
B.T. and M.T.	...	...	...	...	...	...	1
Clinical	...	...	...	...	...	...	4
							<hr/> 52 <hr/>

All Cases Amongst British Troops.

	M.T.	B.T.	Quartan.	Clinical.	Total.
Khartoum ...	5	7	1	2	15
Khartoum North ...	1	2	—	—	3
Rural District ...	6	—	—	—	6
Imported ...	9	5	—	1	15
Relapsed ...	7	4	—	1	12
					<hr/> 28 18 1 4 51 <hr/>

The following table, shewing the number of mosquito infections found and the rainfall during the past six years, is of interest :—

	1930	1931	1932	1933	1934	1935
Rainfall mms. ...	223.1	105.1	191.5	125.6	227.4	225.9
Khartoum ...	2,595	3,500	3,180	1,925	1,395	1,428
Khartoum North ...	554	1,205	2,086	1,059	525	182
Omdurman ...	1,248	2,252	1,690	1,188	2,056	1,909
Rural District ...	5,478	5,442	7,360	3,421	2,772	8,963
TOTAL ...	9,875	12,399	14,316	7,593	6,748	12,482

It will be seen that the number of mosquito infections discovered in 1935 was nearly double that of last year.

This increase occurred entirely in the rural district. The full extension of sanitary control to the northern district of the Blue Nile Province as far south as Masid, added considerably to the area under regular inspection. In addition, measures of control throughout the remainder of the rural district were considerably augmented.

The total cost of anti-mosquito work during the year was £E 3,287. Of this amount £E 2,281 was expended on labour and £E 1,006 on larvicides. The increase of £E 399 over the figure of 1934, was due to extension of the sanitary control mentioned above.

CHICKENPOX.

79 cases were notified as compared with 156 in 1934. The disease broke out at the end of February, and persisted in mild epidemic form until June. From August until the end of the year only 3 cases were discovered.

DIPHTHERIA.

23 cases were reported during the year, of which 9 occurred in non-natives. At no time has the incidence of diphtheria been high amongst natives in this province, and it is probable that, as in other parts of Africa, the native possesses a considerable degree of immunity to the disease.

DYSENTERY.

476 cases of amoebic dysentery and 29 cases of bacillary dysentery were notified. In the previous year the figures were 216 and 33 respectively. The increase occurred principally in the rural district and in the number of imported infections. In the three towns, Omdurman was the main focus of amoebic dysentery. The incidence of primary cases of this disease in Khartoum and Khartoum North was very small.

AMOEBIĆ DYSENTERY.

Primary Cases By Nationality.

British ...	...	...	...	...	...	...	...	...	1
Sudanese	...	...	...	...	...	...	...	...	65

Primary Cases by Age :

Age-Periods.	0-5	5-10	10-20	20-30	30-40	40-50	Over 50.
Cases ...	7	4	17	27	8	1	2

BACILLARY DYSENTERY.

Cases by Nationality.

British ...	...	...	...	...	...	...	...	7
Sudanese	...	...	...	...	...	...	...	16
Others ...	...	...	...	...	...	...	...	6
								29

Cases by Age :

Age-Periods.	0-5	5-10	10-20	20-30	30-40	40-50	Over 50.
Cases ...	5	1	1	7	10	2	3

Primary and Relapsed Cases and Type of Organism :

Organism.	Primary.	Relapsed.	Total.
B. Flexner	12	7	19
B. Shiga	3	2	5
B. Schmitz	2	2	4
Not isolated	1	—	1
	18	11	29

ENTERIC FEVER.

The rise in the incidence of this disease, mentioned in the Annual Reports for 1933 and 1934, was maintained. During the past year 175 cases were notified compared with 101 in 1934. In Khartoum there was an increase of 33, in Khartoum North of 17 and in Omdurman of 7, a total increase of 57 cases contracted in the three towns. 9 cases were notified from the rural district of which 8 occurred at Gebel Aulia. 13 cases were imported from outside the province.

The incidence of the disease in Omdurman, previously the main focus of infection, showed only a slight increase while that in Khartoum and Khartoum North was considerable.

The majority of the cases occurred sporadically and were widely scattered throughout the district. In rare instances more than a single case occurred in one household. During July, 5 cases occurred in one family at Khartoum North ; a relative previously admitted to Omdurman Civil Hospital was the probable source of infection. In Khartoum Deims, there is reason to suppose that one healthy carrier was responsible for at least three cases.

Evidence points to undiscovered early ambulant cases and healthy carriers as being the principal means of the spread of the disease. In these circumstances, the institution of adequate measures of control presents considerable difficulty.

The carrier state is frequently intermittent and may be maintained for an indefinite period. There is no assurance that a recovered case, discharged from hospital and bacteriologically free of infection, may not at some subsequent time relapse and pass virulent bacilli in the stools or urine.

The intimate contacts of each case notified were traced, subjected to medical supervision, and immunized against the disease by inoculation. It is not suggested that this measure provides protection against the source of infection responsible for the original case. In docs, however, surround the recovered patient, a potential carrier on discharge from hospital, with a ring of immunes, and, by so doing, may be of some value.

The practice of mass anti-typhoid inoculation amongst the inhabitants of the three towns is not practicable, nor, in view of the temporary nature of the immunity conferred, is it altogether desirable; the prevention of typhoid fever amongst a civil population is very largely a problem of pure sanitation.

The institution of a piped water supply throughout the three towns and environs may be possible within a relatively short time, and the day for the inception of a water carriage system of sewage disposal should not be long delayed.

Cases by Sex.					Cases by Nationality.				
Male	...	...	...	100	British	...	...	...	1
Female	...	...	...	75	Egyptian	...	...	...	6
				<hr/>	Sudanese	...	...	...	162
				175	Others	...	...	...	6
				<hr/>					<hr/>
									175

Cases by Age							
Age Periods.	0-5	5-10	10-20	20-30	30-40	40-50	Over 50.
Cases	23	34	65	37	10	5	1

Type of Organism.									
B. typhosus	...	...	...	...	...	...	...	...	168
B. paratyphosus	A.	...	...	...	...	...	...	...	3
Clinical	...	...	...	...	...	...	...	...	4
									175

Mortality.

Deaths	...	...	...	...	...	...	...	20
Mortality rate		...	...	...	...	...	...	11.43%

LEPROSY.

22 cases were reported as compared with 27 in 1934. Cases contracted within the province numbered 10 and 12 cases were imported. One case was an Egyptian, the remainder being Sudanese.

Cases by Sex :									
Male	...	...	...	...	...	...	...	...	20
Female	...	...	...	...	...	...	...	...	2
									<u>22</u>

Cases by Age.

Age Periods.				10-20	20-30	30-40	40-50	50-60	60-70
Cases	...	...	...	1	4	4	3	2	8

The following table shows the probable place of infection of imported cases :—

Blue Nile Province	...	...	...	...	...	...	...	3
Berber Province	...	...	...	...	...	...	...	2
Kordofan Province	...	...	...	...	...	...	...	2
Darfur Province	...	...	...	...	...	...	...	2
White Nile Province	...	...	...	...	...	...	...	1
Egypt	...	...	...	...	...	...	...	2
								12

The following table shows the result of a follow-up of 117 cases notified since 1927 :—

**TABLE SHOWING RESULT OF A FOLLOW-UP OF 117
CASES OF LEPROSY NOTIFIED SINCE 1927.**

YEAR.	No. of cases.	Died.	Returned home.	Sent to Gedaref Leper Colony.	Under treatment.	Untraced.
1927	6	1	2	—	2	1
1928	10	5	2	—	2	1
1929	5	1	2	—	2	—
1930	8	—	4	—	4	—
1931	6	2	—	1	3	—
1932	19	3	9	—	6	1
1933	14	—	11	1	2	—
1934	27	1	11	4	6	5
1935	22	1	6	3	7	5
TOTAL	117	14	47	9	34	13

TUBERCULOSIS.

104 cases of pulmonary tuberculosis and 61 cases of non-pulmonary tuberculosis were notified during the year. Of those contracted within the province, pulmonary cases were increased by 12, non-pulmonary cases by two.

There were 9 more imported cases of pulmonary tuberculosis and the same number of imported non-pulmonary cases as compared with last year.

Cases by Sex.

(1) LOCAL CASES.

	Pulmonary.	Non-pulmonary.
Male	46	27
Female	17	17

(2) IMPORTED CASES.

Male	36	14
Female	5	3

Cases by Nationality.

British	2	—
Greek	2	1
Egyptian	1	—
Sudanese	97	58
Others	2	2

TOTAL	104	61
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Cases by Age :

Age Period.	1-5	5-10	10-20	20-30	30-40	40-50	50-60	Over 60
Pulmonary ...	—	2	6	46	25	9	8	8
Non-pulmonary	1	6	7	16	11	6	6	8

Imported Cases—Probable Place of Infection.

PLACE.	Pulmonary.	Non-pulmonary.	Total.
Blue Nile Province	12	7	19
Berber District	4	3	7
Kordofan Province	4	2	6
Dongola Province	4	1	5
White Nile Province	2	2	4
Kassala Province	2	1	3
Halfa District	2	—	2
Upper Nile Province	2	—	2
Darfur Province	2	—	2
Abroad	4	—	4
Unknown	3	1	4
TOTAL	41	17	58

The following table shows the disposal of cases notified during the year :—

	Pulmonary.	Non-Pulmonary.	Total.
Died	33	12	45
Left Province	20	14	34
Still in hospital	22	4	26
Still in Province	27	28	55
Untraced	2	3	5
	104	61	165

The result of a follow-up of 635 cases of pulmonary tuberculosis notified from 1927 to 1934 is shewn in the following table :—

Year of Notification.				No. of cases.	Died.	Condition in December, 1935.			Total.
						Still in District.	Left District.	Untraced.	
1927	Local	...	...	50	28	9	2	11	65
	Imported	...	...	15	4	7	—	4	
1928	Local	...	...	42	26	4	—	12	66
	Imported	...	...	24	8	12	—	4	
1929	Local	...	...	44	20	14	—	10	74
	Imported	...	...	30	11	15	—	4	
1930	Local	...	...	43	27	11	3	2	82
	Imported	...	...	39	19	18	—	2	
1931	Local	...	...	30	21	3	2	4	69
	Imported	...	...	39	16	19	—	4	
1932	Local	...	...	55	37	9	8	1	95
	Imported	...	...	40	22	15	—	3	
1933	Local	...	...	58	40	7	9	2	101
	Imported	...	...	43	17	22	2	2	
1934	Local	...	...	51	36	7	5	3	83
	Imported	...	...	32	8	21	2	1	

The following table shows the occupation of cases of tuberculosis notified during 1935 :—

OCCUPATION.					Pulmonary.	Non-Pulmonary.	Total.
Cultivators	...	...	...	...	18	7	25
Labourers	...	...	...	...	7	10	17
Cooks, Servants, etc.	...	...	...	...	11	2	13
Clerical	...	...	...	...	10	1	11
Merchants, shopkeepers	...	...	...	...	7	2	9
Minor craftsmen	...	...	...	...	5	2	7
Soldiers, orderlies	...	...	...	...	4	3	7
Others	...	...	...	...	4	4	8
Indigent	...	...	...	...	8	1	9
					74	32	106
Women, children, unstated	...	...	...	...	30	29	59
					104	61	165

RABIES.

9 cases of canine rabies and 2 probable cases of camel rabies contracted from a rabid dog, were reported during the year. 4 cases were in Khartoum, 1 in Khartoum North, 4 canine and two camel cases in the rural district.

Under the Rabies Ordinance the whole province was declared an infected area. Control of dogs and destruction of those not under proper control were enforced. 2,446 dogs and 700 cats were killed during the year.

35 persons received Pasteur treatment after having been bitten by, or in close contact with, infected animals.

No case of human hydrophobia was reported.

VACCINATIONS.

The following vaccinations against smallpox were performed during the year :—

			Successful.	Failed.	Unknown.	Total.
Municipal Area	...	...	2,161	148	109	2,418
Rural District	...	...	1,200	990	1,913	4,103
TOTAL	...	...	3,361	1,138	2,022	6,521

DISPENSARIES.

Khartoum North.

Inpatients numbered 865 as compared with 1,040 in 1934. Only 297 cases of malaria were admitted, a decrease of 197 cases on the figure for the previous year. This fall in the admissions for malaria accounts for the fall in the total number of inpatients.

The appointment of a trained Sudanese nurse in September was followed by a considerable rise in the number of females treated as inpatients.

There were 57,667 attendances for outpatients treatment during the year an increase of 7,762 over the figures for the previous year.

Seven deaths amongst inpatients occurred during the year. The cause of death was diphtheria 2, pulmonary tuberculosis 2, diarrhoea 1, bacillary dysentery 1, and heart disease 1.

Rural District Dispensaries.

Attendances during the year :—

Geili	...	...	...	...	...	...	...	7,384
Khileila	...	...	...	...	...	...	...	9,453
Gordon's Tree	...	...	...	...	...	...	...	9,087
Sururab West	...	...	...	...	...	...	...	7,990
Gereif East	...	...	...	...	...	...	...	10,320
Tuti Island	...	...	...	...	...	...	...	17,886
Deim Abu Saad	...	...	...	...	...	...	...	24,349
Ailafun (Blue Nile Province)	...	...	...	...	...	...	...	12,728
TOTAL	...	...	...	...	...	...	...	99,197

Regular tours throughout their districts were undertaken during the year by officials in charge of the dispensaries.

KHARTOUM NORTH CENTRAL PRISON.

The average daily strength of prisoners of all categories was 417.

The general health of the prisoners has been satisfactory, and there was no outbreak of epidemic disease. 89 inpatients received treatment in the prison dispensary compared with 123 in 1934. The number of outpatient attendances rose from 31,742 in 1934 to 35,295 in 1935. This figure includes attendances by warders and their families. Four deaths occurred in the prison hospital, one from pneumonia, two from pneumococcal meningitis and one from bacillary dysentery.

During the latter half of the year 24 cases from the Province prison were admitted to a separate block of the Central Prison for treatment.

The prison diet has an approximate calorie value of 3,200. On this all the able-bodied have been able to carry out hard and useful work and the health and state of nutrition has been well maintained.

SCHOOL MEDICAL SERVICE.

The work of this service was maintained. 2,460 pupils were examined, of whom 1,466 were referred for treatment. As in previous years affections of the eye constituted a large proportion of all morbid conditions found. The general standard of health was satisfactory and there was no evidence of malnutrition.

The following table presents a summary of the results of school medical inspection during the past two years :—

		1934	%	1935	%
		-----	-----	-----	-----
Number of pupils examined	...	2,361	—	2,460	—
Number referred for treatment	... ..	1,114	47.2	1,466	59.6
Trachoma	... ..	646	27.4	1,120	45.5
Defective Vision	... ..	380	16.1	245	9.96
Dental Caries	... ..	114	4.8	245	9.96
Albuminuria...	... ..	103		43	
Splenomegaly	... ..	30		13	
Disease of the ear, nose and throat	...	15		32	
Cardiac defects	... ..	12		30	
Pulmonary disease (non-tubercular).	...	3		3	
Physical defects	... ..	26		33	
Markedly bad physique	... ..	3		2	
Urinary bilharzia	... ..	12		—	
Other conditions	... ..	22		27	

The increased incidence of trachoma is at first sight unsatisfactory. It is, however, in some degree explained by the altered scope of the inspection. In 1934 1,009 pupils were examined in the primary and intermediate schools and 1,114 in the elementary schools. In 1935 the primary and intermediate schools constituted only 981 pupils, whilst 1,479 were examined in the elementary schools. In 1934 in a Mission School 198 girls were examined and 28% were found to have active trachoma. Private medical arrangements have subsequently been made for this school, and it was not included in the 1935 inspection.

In the higher grade schools, even in the first year, a majority of the pupils have undergone some previous treatment for trachoma. In the elementary schools but few of the new pupils have been submitted to treatment, and in this type of school the incidence of the active disease is invariably greater than in the higher schools. Thus the increased number of pupils examined in the elementary schools was a factor contributing to a raised percentage of trachoma.

The following table shows the number of pupils examined in the higher grade and in elementary schools with the number referred for treatment, cases of trachoma and of dental caries :—

				Higher Grade Schools.	%	Elementary Schools.	%	
				_____	_____	_____	_____	
Number examined	...	...	...	981		1,479		
Number referred for treatment				...	466	47.5	1,000	67.6
Trachoma	270	27.5	850	57.5
Dental caries	55	5.6	190	12.8

In the Gordon Memorial College are some 400 boys over whom adequate medical supervision can be exercised. Regular treatment for trachoma was instituted in 1932.

The following table showing the percentage of boys with active trachoma in 1932 and subsequent years provides an adequate commentary on the value of the measures which have been put into force :—

[illegible]

METEOROLOGICAL OBSERVATIONS
AT
STACK MEDICAL RESEARCH LABORATORIES, KHARTOUM.
1935.

Month.	Temperature in Degrees Fahrenheit				Average Relative Humidity % at 8 a.m.	Average Evaporation in m.m.	Rain in m.m.	Haboobs and Sand storms	Prevailing Winds
	Highest Max.	Average Max.	Lowest Min.	Average Min.					
January ...	103.3	94.3	56.8	61.7	41	8.6	—	—	N to NE.
February...	103.5	91.9	51.8	59.2	34	9.7	—	2	N to NE.
March ...	101.1	103.1	63.5	69.8	33	12.2	—	2	N.
April ...	111.2	103.0	62.0	70.5	27	13.1	Drops	8	N Veering E & S.
May ...	110.0	105.6	66.8	75.4	35	13.0	Drops	5	Veering NE to SW
June ...	111.2	104.5	70.4	78.5	50	12.8	37.3	11	SW.
July ...	111.2	101.7	70.9	78.8	57	10.9	20.9	1	SW.
August ...	101.8	94.5	68.4	74.5	73	7.6	160.1	4	WSWtoSSWVeering
September	109.6	100.0	73.4	77.7	59	9.7	7.4	1	SSWtoWSWVeering
October ...	109.4	104.7	71.6	77.2	36	10.5	0.1	—	NNW to ENE.
November	103.0	96.6	62.4	65.1	32	9.0	0.1	—	N.
December	100.8	92.9	54.8	62.2	36	8.6	—	—	N.
TOTAL =							225.9	34	Max. Wind Veloc. 90 Kilom. per hour.

GEBEL AULIA DAM.

The number of labourers employed on the dam this year during the period of greatest activity was in the neighbourhood of 10,000, approximately double the number employed in 1934.

About half these labourers were imported from Egypt.

It is satisfactory to note that notwithstanding the larger population at risk there was no marked increase in the incidence of disease.

No epidemic occurred, and only three cases of cerebrospinal meningitis were notified as compared with 82 last year. Precautions had been taken early. The medical authorities took charge of the spacing and housing of labourers, special attention was paid to the ventilation of huts, and labourers were encouraged to sleep in the open. Recruitment of local labour was controlled, and men coming from infected areas in the Sudan were quarantined apart.

The incidence of fly-borne disease was maintained at a satisfactory low level. 50 cases of dysentery occurred as compared with 37 last year. During the summer months two mild cases of enteric fever were diagnosed ; both cases were imported.

83 cases of vesical bilharzia were admitted ; 15% of these were relapses of cases previously treated at the Halfa quarantine and at the Silitat colony.

Routine examination of stools revealed ancylostoma infection in 276 cases. Only 32 of these gave rise to symptoms. As a source of potential disability ancylostomiasis provides one of the chief problems to be dealt with by medical and sanitary control.

In spite of the increased number of labourers there was a satisfactory decrease in admissions for malaria. 173 cases were treated as compared with 222 last year.

Sanitation.

In dealing with a large and mixed population of unsophisticated labourers the essential features in sanitary control are the avoidance of overcrowding and the provision of a satisfactory system of conservancy.

In both respects there has been a marked improvement on the conditions prevailing last year. This improvement is reflected in the low incidence of epidemic and endemic disease. The double bucket system serves the residential area and the east bank. It is also employed in the vicinity of the actual works.

Portable single, double, and four-seater bucket latrines for the use of labourers are sited at convenient places.

The 14-seater flush latrine continued to function satisfactorily in the Saidis' camp.

Pit latrines are installed in the neighbouring villages.

Water Supply.

Water supplies for the colony and for the Saidi camps are now on a separate system. The former is pumped to a 24,000 gallon tank and treated by a Patterson filter plant.

The Saidis draw their water from a large 100,000 gallon reservoir which is treated thrice daily with chlorosene and ammonium chloride. Results have proved satisfactory. Repeated tests have shown this water to be of a potable standard.

(b) BLUE NILE PROVINCE.

Generally speaking, food was plentiful and the condition of the people good.

The early rains were well spaced and light. The total rainfall over the Gezira was roughly normal. The attendances for malaria were not high; indeed, next to 1934, they were the lowest for the last five years.

Bilharzia—judged by the annual survey—seems to have made no headway in the irrigated area. Every year hundreds of western immigrants, infected with the disease, enter the Gezira. It is only by the use of every precautionary measure that the area can be kept clear of bilharzia.

There was no serious epidemic during the year. Cerebrospinal meningitis appeared in April and May. In all 48 cases were seen.

As shown in the following table, there has been a steady fall in the number of cases of dysentery, possibly as a result of the increased attention paid to sanitation, the provision of better water supplies, and the prevention of fly breeding :—

1930	...	...	...	...	201	1933	...	...	...	...	168
1931	...	...	...	...	261	1934	...	...	...	...	131
1932	...	...	...	...	185	1935	...	...	...	...	93

Of the 1935 cases amoebae were found in 56 and dysentery bacilli in 3.

There is no evidence of an increased incidence of enteric fever. Eight sporadic cases occurred, of whom five died.

42 cases of pulmonary tuberculosis were admitted for treatment. There were fewer cases in 1934, but the figures for 1935 are roughly the same as for the four years 1930—1933. 14 patients died, a mortality rate of 33%.

GEZIRA IRRIGATION SCHEME. The two main objects of the sanitary work in the Gezira are :—

- (a) To protect the water supply.
- (b) To control mosquito-breeding.

Protection of the water supply. The most convenient sources of water for domestic purposes are the canals, and the majority of natives draw their supplies from this source. Unfortunately the canals are used also as latrines. The pollution is greater in the non-watering season when the canals hold stagnant water.

The problem has been dealt with on the following lines :—

- (1) The provision of an alternative water supply. The ideal is that each village should have a well. Wells have already been provided in a number of villages. This has allowed more canals to be dried out during the non-watering season than in previous years. Not only is a potential source of infection removed, but snails are destroyed, also weeds which give food and shelter to snails.
- (2) Measures to prevent the pollution of canals. The removal of temporary villages and encampments was completed during the year. Over one hundred were transferred from sites near canals to village areas at least 300 metres from a canal.

A start was made also to lay out one or two permanent villages, but this presented a more difficult problem.

The installation of pit latrines in those villages near canals was continued. Twenty-one new pit latrines were installed during the year.

- (3) Propaganda was used in schools and dispensaries to explain the method of transmission of bilharzia and the means of safeguarding the water supply.

The control of mosquito breeding. Further progress was made in permanent measures. The work of filling in disused canals and scour pits, depressions and borrow pits continued. The digging of a borrow pit was made a punishable offence.

Drainage is improved from year to year as experience points the way. Its value is great in years of heavy rains. Baling throughout the scheme was of good standard.

The experiment of oiling the cultivation water channels which was started in 1934 was extended this year to ten blocks. In three blocks thus treated the percentage of pools holding mosquito larvae was only 6.25% as compared with 41.87% in three untreated blocks alongside.

The oiling of scour pits was better done than in 1934, and fewer infections were found in these sites than in the years before the method of control was started.

A survey of the different kinds of weeds growing in canals and their habits has been partly completed. It may be possible to devise some new and effective method of weed destruction and control, and so remove a source of mosquito breeding and harbourage.

Gambusia (mosquito larvae-eating fish) have been introduced into the wired-off tail ends of canals, where they appear to thrive and increase.

(c) WAD MEDANI.

(Population 33,000).

Work was carried out along the same general lines as last year. Mosquito control has been extended and steps have been taken to further reduce fly breeding in the town.

Conservancy. Considerable progress has been made during the last few years to provide some suitable form of latrine accommodation throughout the town. The programme of replacing bucket latrines by pit latrines has been continued. There are now 1,529 private pit latrines in the town, 29 boreholes and 14 public pit latrines.

Water supply. A piped supply to the town was installed three years ago. This has not been extended yet to the native quarter where most of the townspeople live.

The supply, although generally described as "potable," was found not to be of the standard expected after thorough treatment. Adjustments and modifications were made in the process and the supply improved.

(d) A T B A R A .

(Population 20,000).

Malaria. As shown by recorded attendances, there is again a fall in the incidence of malaria, in the southern half of the Northern Province.

The decrease is related to : (a) improved clinical recording, (b) extension of control measures and the issue of quinine on scale (c) favourable environment, flooding having been less than formerly.

Antimalarial work continues regularly within the enlarged area of sanitary control, the pools formed by the falling Atbara and Nile rivers are a constant source of danger. Boats have been quarantined and disinfected before being allowed to proceed.

Fly-borne diseases. 73 cases of dysentery were admitted as compared with 93 last year.

One case of typhoid fever occurred in the market area. A sample of water from the well of the house was shown to be contaminated. The well was filled in, and all other wells in the neighbourhood were treated with potassium permanganate. The control of fly-breeding in Atbara is a difficult problem owing to the proximity of native villages. Measures taken for the further protection of the town residential area include an extension of the sanitary control and the expropriation of native owned land in close proximity to the cantonment; the latter has been cleared and a vegetable garden laid out on the site.

Installation of public and private latrines in neighbouring villages is a further necessary measure of control.

Ten more public latrines were erected within the cantonment during the year.

Water supply. Drinking water is obtained from the Nile and is sedimented and chlorinated, but not filtered. The settling tanks are inadequate for the purpose of producing clear water during the flood. In the British barracks the water, after chlorination, is passed through pressure filters. Examination of samples shews that the water is of a high standard of potability.

(e) PORT SUDAN.

(Population 19,000).

The general health of the port and district has been good.

The mild epidemic of measles which was reported last year continued during the first six months of the year, accounting for 55 admissions to hospital.

Sporadic cases of chicken-pox occurred throughout the year. The fly-breeding season (November and December) accounted for a high incidence of bacillary dysentery and infantile diarrhoea.

Attacks of enteritis were frequent in all sections of the population during this period. Children under 5 years were largely affected. 27 deaths are recorded but the true mortality figures are probably much higher. Eight cases of enteric fever were admitted to hospital of whom one died.

Conservancy. Septic tanks now total 46, cess-pools with water closet connections, 66.

The septic tank at the hotel, which is the oldest in the town, has not had its effluent pit emptied since 1931, when a third effluent pit was added.

Overloading the public latrines is liable to occur from time to time, and the effluent pits have to be emptied, but, on the whole, this system works extremely well.

Further progress has been made in the installation of pit latrines in native areas.

Mosquito control. The pools of sea water at the south west end of the harbour have been infested several times during the year. Of a total of 178 infestations found in the area during the year, 100 were culex, 67 stegomyia and 11 anopheles.

87 cases of malaria were admitted but probably none of these were local infections.

Rats. The rat population is being kept within reasonable limits.

The totals caught for the last four years are :—

1932	1933	1934	1935
<hr/> 6,885	<hr/> 6,454	<hr/> 6,705	<hr/> 6,134

Of the 6,134 rats caught this year :—

20.4% were *Rattus rattus rattus*.

21.3% were *Rattus rattus Alexandrinus*.

58.3% were *Rattus rattus frugivorus*.

These findings approximate closely those of previous years.

Rat Fleas. The flea census per month together with the prevailing atmospheric conditions were as follows :—

MONTH.	Fleas per rat.	Average Temperature Shade.		Average Relative Humidity.
		Maximum °C.	Minimum °C.	
January	0.8	28.0	20.9	73.4
February	1.0	27.3	18.7	61.4
March	1.0	29.2	21.0	69.0
April	0.7	31.0	20.8	59.9
May	1.0	35.0	25.2	61.5
June	0.6	39.1	26.9	40.3
July	0.8	40.4	27.6	41.4
August	1.3	40.3	29.3	40.2
September	1.0	38.4	27.8	51.4
October	1.0	34.2	25.9	67.8
November	0.7	30.4	24.2	70.3
December	1.1	28.4	23.0	65.6

It will be seen that the maximum number of fleas per rat was found when the average maximum temperature was 40.3° Centigrade and the average relative humidity 40.2, the minimum when the temperature was 39.1° Centigrade and the humidity 40.3.

Water Supply. The water supply of the town is from Khor Arbaat, a natural sub-soil reservoir in the hills, 20 miles from Port Sudan.

No new constructional work has been done during the year, and the quality of the water continues satisfactory.

VITAL STATISTICS.

Population. The following tables gives the area and approximate population of the provinces of the Sudan.

The population figures, even in the northern provinces, can only be regarded as a very rough estimate and are of very limited utility in the determination of birth and death rates.

They are however of some value in relation to the incidence of endemic and epidemic disease, providing some estimate of the population at risk :—

PROVINCE.	Square Miles.	Approx. Population.
Blue Nile	43,900	834,735
Darfur	137,900	715,543
Equatorial	151,800	925,105
Kassala	140,600	419,857
Khartoum	5,700	271,870
Kordofan	146,800	1,162,651
Northern	234,400	446,695
Upper Nile	92,200	502,163
White Nile	16,300	452,612
	969,600	5,731,231

BIRTHS AND DEATHS.

The return of births and deaths can only be considered in any way correct in Khartoum and the Northern Province. The returns for the Blue Nile are still very incomplete ; they are included in the list given below, but it would be unsafe to draw any conclusions from them :—

The table shows the births, deaths by ages and still-births of Khartoum and Blue Nile Provinces, Berber and Dongola Districts, and of Wadi Halfa Town which are considered to be approximately correct.

NATIONALITY.	Births.		Deaths by ages.							Total deaths.		Total still births	
	Male.	Female.	Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60	Male	Female	Male	Female
British	4	5	—	—	—	1	2	2	1	6	—	—	—
Greek	6	8	—	—	1	—	2	2	3	8	—	—	2
Other Europeans	8	10	—	1	1	—	1	2	—	3	2	1	—
Egyptians & Syrians	189	206	22	5	1	8	20	13	23	53	39	9	3
Sudanese ...	9935	9439	861	1559	514	566	1795	1320	2889	4853	4651	337	207
All others ...	442	316	21	41	14	45	136	175	131	350	213	3	3
Total	10584	9984	904	1696	531	620	1956	1514	3047	5273	4905	350	215
Grand Total...	20568					10178				10178		565	
% deaths by ages..			8.8	15.8	5.2	6.1	19.2	14.9	29.9				.

NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1932		1933		1934		1935	
	Total	Rate.	Total.	Rate.	Total.	Rate.	Total.	Rate.
Khartoum :—								
Births	4959	17.8	5147	20.4	4013	16.2	4156	15.2
Deaths	2399	8.6	2857	11.3	2470	9.9	2087	7.6
Still births ...	163	32.8	130	25.2	129	32.1	142	34.1
Infantile mortality	287	57.8	428	83.1	298	74.2	234	56.3
Berber District :—								
Births	5721	34.5	6606	37.7	3830	22.7	3881	20.5
Deaths	2878	17.3	4031	23.0	2385	14.1	1746	9.2
Still births ...	95	16.6	126	19.1	48	12.5	66	17.0
Infantile mortality	474	82.8	565	85.5	257	67.1	165	42.5
Dongola District :—								
Births	6005	37.9	6187	33.0	5118	32.4	5056	26.3
Deaths	2729	17.1	3050	16.2	2334	14.7	2525	13.1
Still births ...	335	55.7	268	43.3	205	40.0	246	48.6
Infantile mortality	623	103.7	581	93.9	270	52.8	257	50.8
Blue Nile District :—								
Births	10255	20.6	5647	11.1	6558	13.2	6638	16.1
Deaths	5948	11.9	4106	8.1	3958	8.0	3379	8.1
Still births ...	186	18.1	98	17.3	60	9.1	69	10.3
Infantile mortality	637	62.1	430	76.1	390	59.4	188	28.3
Wadi Halfa Merkaz :—								
Births	785	15.0	765	11.9	816	13.4	796	12.1
Deaths	460	8.7	567	8.8	628	10.3	422	6.3
Still births ...	10	12.7	14	18.3	14	17.1	39	48.9
Infantile mortality	120	152.8	163	213.0	127	155.6	60	75.3

MATERNITY AND CHILD WELFARE.

MIDWIVES.

The School of Midwifery at Omdurman continues to carry out excellent work.

24 pupil midwives were trained during the year, and passed out successfully.

Six trained midwives attended a revision course.

The School was opened fifteen years ago, and 244 midwives have been trained. Of these, 196 are still in practice. Their distribution is as follows :—

Khartoum	... 48	Northern Province	59	Blue Nile	... 28
Kordofan	... 21	White Nile	... 11	Kassala	... 19
Darfur	... 7	Upper Nile...	... 3		

Midwifery in Omdurman is carried out entirely by trained midwives.

A total of 516 cases were attended in the district by the pupil midwives, and of these 16 were transferred to hospital.

There were no deaths among the remaining 500.

The Inspectress and Matron of the Midwifery School make annual tours in the provinces for the inspection of trained midwives, and for the recruitment of suitable candidates for training.

The work of these rural midwives is no longer confined to provincial towns, but has extended to widely scattered villages. This increased activity marks a real advance in the progress of preventive medicine in rural areas, since it not only results in an extension of sound midwifery practice, but provides the means by which the elements of hygiene and public health are introduced into the very heart of village life.

In their practice, midwives assume the rôle of health visitor, and teach women in their homes the general care of health, nutrition and the preparation of food, the value of clean houses and compounds.

MATERNAL MORTALITY.

The following statistics relating to maternal mortality and the complications of pregnancy and child birth are compiled from the returns of the civil and Church Missionary Society hospitals in Omdurman, from the Midwifery-Training School and the trained native midwives of Omdurman.

These figures cannot be taken as typical of the whole of Khartoum Province or of the northern Sudan, but they give some indications of the risk associated with pregnancy and parturition, conducted under the best available conditions:-

Total Cases	...	...	...	...	...	...	...	...	1879
Abnormal	...	...	...	...	...	...	...	...	171
Died	...	...	...	...	...	...	...	...	5

Births	...	...	...	...	...	...	...	...	1833
Alive	...	...	...	...	...	...	...	...	1742
Still-born	...	...	...	...	...	...	...	...	51

Complications and Cause of Death.					Total.	Recovered.	Died.
Abortions	{	Septic	...	...	1		
		Others	...	...	85		
					86	86	—
Puerperal sepsis	{	Normal labour	...	12			
		Abnormal „	...	9			
					21	20	1
Puerperal haemorrhage. Placenta praevia				3			
		Other causes	...	29			
					32	32	—
Puerperal albuminuria and convulsions					1	1	—
Other toxaemias of pregnancy			...		5	5	—
Phlegmasia alba dolens			...	...	1	1	—
Embolism	...	...	...	...	1	—	1

Other accidents and abnormal conditions of the puerperal state :—					Total.	Recovered.	Died.
Obstructed labour	...	...	...	...	55		
Malpresentation	...	...	...	...	13		
Retained placenta	...	...	...	...	6		
Puerperal mania	...	...	...	...	3		
Neurotic vomiting	...	...	...	...	2		
Anaemia of pregnancy	...	...	...	...	1		
					80	79	1
Illnesses complicating but not due to pregnancy	...	...	...	...	39	37	2
Pregnancy terminated as result of illness	...	...	...	...	8	8	—

INFANT MORTALITY.

The infant mortality for the three towns—Khartoum, Khartoum North and Omdurman was as follows :—

							Per 1,000 births.
Khartoum	...	...	...	...	...	...	57.71
Khartoum North	...	...	...	...	...	...	59.20
Omdurman	...	...	...	...	...	...	64.81

A higher rate in the case of Omdurman and Khartoum North is to be expected by reason of the class of inhabitant, housing conditions and the general standard of living.

The following tables are the result of an analysis of 234 infant deaths and 200 deaths in children between 1—5 years :—

Infant deaths (0-1 year) :—

CAUSE OF DEATH.					No. of Deaths.	Percentage of total.
Diarrhoea and Enteritis	...	...	...	...	72	30.77
Congenital defects, Prematurity, Malnutrition	...	...	...	...	65	27.78
Pneumonia and Bronchitis	...	...	...	...	55	23.50
Fever, including Malaria	...	...	...	...	25	10.64
Syphilis	...	...	...	...	14	5.98
Other causes	...	...	...	...	3	1.33

Deaths in childhood -(1-5 years) :—

CAUSE OF DEATH.					No. of Deaths.	Percentage of total.
Diarrhoea and Enteritis	...	...	...	...	100	50.0
Pneumonia and Bronchitis	...	...	...	...	41	20.5
Fever, including Malaria	...	...	...	...	33	16.5
Violence (all forms)	...	...	...	...	10	5.0
Zymotic diseases	...	...	...	...	5	2.5
Septic conditions	...	...	...	...	5	2.5
All other causes	...	...	...	...	6	3.0

In considering these figures it should be borne in mind that many of the deaths were notified by officials not possessed of a complete medical education. Frequently the deceased was not seen until after death and in some cases notification of the cause of death depended upon the evidence of relatives.

The above tables probably represent fairly accurately the principal causes of infant mortality in the northern Sudan.

In the south, infant deaths due to malaria outweigh all others.

MATERNAL AND CHILD WELFARE CLINICS.

These clinics continue to carry out excellent work. They have proved to be of benefit to the health of the women and infants and are a considerable factor in reducing infant and maternal mortality.

There are now nine clinics in the larger towns. Six of these are in and around Khartoum with two subsidiary clinics in villages nearby, one each in Port Sudan, Wad Medani and Atbara.

8,196 attendances are reported in Khartoum and Omdurman. Of these 2,276 were cases of pregnancy representing more than 50% of the total pregnancies in these towns during the period.

In teaching the value of ante-natal, postnatal, and infant care, opportunity is taken to stress the importance of diet and food values. As a result, there is already a noticeable improvement in the health of both mothers and infants.

MEDICAL EXAMINATION OF SCHOOLS.

The examination and treatment of school children has made satisfactory progress.

25,906 children were examined as compared with 22,751 in 1934.

The major cause of disability in the northern provinces is trachoma, malaria in the south.

In one school in the Equatorial Province blood examination showed the presence of malarial parasites in over 36% of the children examined.

As observed elsewhere, trachomatosis infection occurs in the home during the pre-school period. Until the standard of living and education of the population reach a much higher standard, prevention of infection is not to be expected. Early treatment is therefore of the greatest importance and special attention has been given to this condition in village schools. Treatment has everywhere been carried out more regularly and intensively than hitherto.

Results obtained at the Gordon Memorial College, Khartoum provide striking evidence of the value of regular treatment. In 1932, when adequate medical supervision was first organised, the percentage of boys with active trachoma was 82.8%. In 1935 this figure was reduced to 23.6%.

No case of pulmonary tuberculosis was discovered during the medical examination of school children.

MEDICAL EXAMINATION OF SCHOOLS.

25,906 children were examined and necessary treatment arranged, compared with 22,751 in 1934, and 18,160 in 1933.

The following table shows the results of the examinations :—

PROVINCE OR DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost
Bahr El Ghazal :—						
4 Girls'	122	5.7	—	16.4	—	—
8 Boys'	651	6.4	.4	19.9	—	4.7
Berber :—						
2 Intermediate ...	119	4.2	—	4.8	—	—
1 Technical ...	84	22.6	.2	.2	—	—
5 Girls'	308	33.1	.1	.2	—	—
7 Elementary ...	953	40.6	2.2	6.7	—	—
29 Village... ..	1,052	44.9	2.2	15.8	—	—
Blue Nile						
2 Girls'	151	13.9	—	2.0	—	—
Elementary ...	348	27.6	.6	3.5	—	—
Village... ..	11,255	19.0	.1	28.1	—	—
Darfur :—						
2 Elementary ...	187	59.9	19.2	29.9	—	—
4 Village	458	64.2	15.1	34.9	—	—
Dongola :—						
8 Elementary ...	1,225	59.2	5.1	10.6	—	.6
2 Village... ..	240	58.3	5.8	13.3	—	—
Fung :—						
3 Elementary ...	323	17.6	.6	48.9	—	—
1 Girls'	38	28.9	—	68.4	—	—
8 Village... ..	456	39.0	—	61.9	—	—
Halfa :—						
1 Intermediate ...	81	50.6	7.4	3.7	—	6.2
2 Elementary ...	260	34.2	27.7	3.1	—	3.9
Kassala :—						
2 Elementary ...	206	34.9	—	16.0	—	—
28 Village... ..	1,128	38.4	—	22.7	—	—
Khartoum :—						
Gordon College	355	23.9	—	—	—	—
Technical School	119	42.2	—	.9	—	—
3 Intermediate ...	474	27.8	—	—	—	—
11 Elementary ...	1,479	57.5	—	.8	—	—
Unity High School ...	33	6.1	—	—	—	—

Medical Examinations of Schools.—(Contd.)

PROVINCE OR DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost
Kordofan :—						
1 Primary ...	49	65.3	4.1	18.4	—	—
12 Elementary ...	909	21.4	34.1	33.9	—	—
32 Village... ...	441	35.8	18.3	29.7	—	—
Mongalla :—						
2 Intermediate ...	189	4.8	.6	11.6	—	2.7
Port Sudan :—						
1 Primary ...	95	17.9	1.1	5.1	—	—
5 Elementary ...	399	33.5	.2	1.0	—	—
3 Village... ...	154	39.6	5.2	1.3	—	—
Upper Nile :—						
1 Elementary ...	113	25.6	.9	30.9	—	—
5 Village... ...	209	22.5	—	18.1	—	—
White Nile :—						
Teachers' Training College ...	52	73.1	9.6	13.4	—	—
1 Girls'	86	76.7	—	14.0	—	—
8 Elementary ...	672	48.5	8.5	29.3	—	—
19 Village... ...	533	31.3	5.6	38.1	—	—

QUARANTINE.

(a) PORT SUDAN QUARANTINE.

Quarantine for smallpox was enforced against Bombay in March, and was continued to the end of the year.

Quarantine measures were enforced against Bombay from March until June and from September to November, on account of cholera.

The following table shows the number of ships entering the port during the last six years :—

	1930	1931	1932	1933	1934	1935
Ships arriving	944	888	808	778	886	1181
Sailing Vessels	529	530	546	423	509	535
Warships British	20	18	7	14	15	60
„ French	9	4	2	6	6	3
„ Italian	3	4	—	—	1	3
Persons isolated from ships ...	2	—	—	1	7	8

No ships have been quarantined during the year.

(b) **WADI HALFA QUARANTINE.**

4,133 Egyptian labourers passed through the quarantine of whom 32 were repatriated as unfit. 567 were treated for bilharziasis either at Wadi Halfa or on arrival at their destination.

(c) **SUAKIN QUARANTINE.**

The number of pilgrims leaving Suakin showed an increase.

The figures for the last six years are as follows :—

1930	...	...	...	...	4,791	1933	...	...	...	...	970
1931	...	...	...	...	2,414	1934	...	...	...	...	1,459
1932	...	...	...	...	1,348	1935	...	...	...	...	1,672

All pilgrims were vaccinated, and received one inoculation against cholera before departure. They paid, in advance, their return fare by steamship, and the quarantine charges in the Hedjaz and at Suakin. 1,576 pilgrims passed through Suakin on their return to the Sudan. Only three of these had not proceeded by Suakin,—two repatriated slaves and one pilgrim who reached the Hedjaz by sailing boat from Massawa.

One case of smallpox was reported at Atbara and two at Gedaref among the first batch of returning pilgrims, after their discharge from quarantine. The period of quarantine was therefore extended from five to eight days. Otherwise the general health of the pilgrims was satisfactory. Thirty one were admitted to hospital of whom two died.

During the last eight years 1,546 pilgrims who sailed from Suakin have not returned : 198 were Sudanese and 1,348 West Africans.

OPHTHALMIC REPORT

BY MR. A. R. MCKELVIE.

47 male beds were provided in the River Hospital and 20 female beds, maximum total—67.

					River Hospital.	Omdurman Hospital.	Total.
Inpatients...	...	...	...	...	441	60	501
Outpatients attendances			...	...	27,494	41,479	68,973
Operations	...	...	...	...	408	45	453

Number of new outpatients at the River Hospital tabulated according to diseases :—

Months	Cataract	Glaucoma	Trichiasis	Hordeolum Meibomian Cysts	Pterygium	Myopia	Blepharitis	Lachrymal Sac.	Strabismus	Foreign body	Refractions	Total per month
January ...	42	30	9	7	5	3	3	—	1	19	36	155
February ...	39	40	32	10	10	2	2	1	—	37	40	213
March ...	33	11	30	7	2	1	1	1	2	20	30	138
April ...	10	21	1	10	4	6	4	1	—	62	50	169
May ...	25	14	13	11	3	2	1	2	1	22	43	137
June ...	32	16	10	14	11	4	1	1	1	19	42	151
July ...	13	29	1	21	5	2	5	1	—	35	62	174
August ...	10	12	4	3	3	2	2	6	—	20	16	78
September ...	5	4	1	6	2	3	6	6	—	14	10	57
October ...	15	13	1	6	4	1	1	—	2	19	8	70
November...	11	15	6	5	3	—	4	1	1	30	19	95
December ...	15	17	3	3	5	1	1	1	2	31	9	88
TOTAL ...	250	222	111	103	57	27	31	21	10	328	365	1525

The new cases of Trachoma and Conjunctivitis are not included in the above list.

TABLE SHOWING ATTENDANCES AT THE RIVER HOSPITAL
DURING THE YEAR 1935.

MONTH.	Trachoma.	Conjunctivitis.	Cataract.	Glaucoma.	Trichiasis.
January	554	512	112	303	20
February	1,023	633	119	227	36
March	925	670	233	202	36
April	1,025	610	110	271	10
May	1,125	822	223	204	53
June	843	650	130	210	50
July	1,136	780	113	230	33
August	1,005	652	110	210	31
September	997	770	121	200	31
October	925	488	170	263	35
November... ..	837	668	191	276	46
December	610	777	174	278	55
TOTAL	11,005	8,032	1,806	2,874	436

MONTH.	Hordeolum Meibomian Cysts	Pterygia	Vision test- ing and Refractions	Blepharitis	Lachrymal Sac.	Foreign bodies
January	27	30	69	4	1	19
February	62	50	58	22	2	37
March	37	21	87	52	39	20
April	85	90	157	104	41	62
May	60	53	128	31	59	32
June	80	50	54	81	42	19
July	60	30	120	50	30	35
August	20	11	53	62	75	20
September	20	30	55	98	6	14
October	36	63	67	30	—	19
November	24	25	151	48	5	30
December	28	31	33	41	25	31
TOTAL	539	484	1,032	623	325	338

Grand Total for year 1935—27,494.

Grand Total for year 1934—13,983.

SUBJECTS OF SPECIAL INTEREST.

(a) INTERIM REPORT ON KALA-AZAR INVESTIGATIONS (By Sir Robert Archibald, Adviser in Medical Research).

In view of the possibility of Kala-azar being conveyed from man to man by blood-sucking insects, it was important to ascertain whether *Leishmania* parasites were present in the peripheral blood of cases of Kala-azar in all stages of the disease. A thorough examination of 190 peripheral blood films taken from 31 cases of Kala-azar showed parasites present in 2 cases = 6.4 per cent. In each case the parasites were found phagocyted within a polymorph and mononuclear leucocyte respectively. One case contracted the disease in the Fung, the other case contracted the disease in Eastern Mongalla.

Nasal swabs from 22 cases showed *Leishmania* parasites in 7 cases = 31 %. In two cases heavy infections were found.

Examinations of faeces, centrifuged urine and conjunctival secretions of cases of Kala-azar proved negative for *Leishmania* parasites.

Examinations of the viscera of dogs, cats, ground squirrels, fowls, gekkos and lizards in Kala-azar villages proved negative for *Leishmania* parasites.

Examinations of large numbers of wild sand flies, mosquitoes, house-flies, lice and bed bugs caught in Kala-azar huts, and in the Kala-azar ward of Singa hospital showed no evidence of *Leishmania* parasites or their cultural forms.

Epidemiological data collected strongly indicate "the contact factor" with or without an intermediate host as an important factor concerned in the endemiology of a disease which, so far, has not appeared in epidemic form.

Examinations of all contacts of cases of Kala-azar is an essential measure in the control of the disease ; it will serve to detect early cases as well as cases who are not seeking medical treatment ; such cases as proved at Daragil assist in maintaining infection in villages.

In two instances young infants born of mothers suffering from Kala-azar showed no signs of the disease four to six months after birth.

No evidence has been found, or exists that Dermal Leishmaniasis occurs in the Fung or Rahad districts.

Oral Leishmaniasis is probably more common than is suspected. One case admitted to hospital for necrosis of the jaw showed *Leishmania* parasites in a slightly enlarged spleen, numerous parasites in nasal swabs, and one parasite phagocyted in a leucocyte was found in the peripheral blood.

Animal Experiments.

Grey monkeys have been infected by subcutaneous inoculation of *Leishmania* parasites.

Leishmania parasites have been found in nasal swabs taken 21 days after intraperitoneal inoculation with *Leishmania* parasites.

Grey monkeys have been infected by nasal swabbing and nasal spraying of infective material.

Two out of five healthy monkeys contracted Kala-azar infection when placed in contact with five experimentally infected monkeys in an insect-proof room.

Various other experimental investigations on monkeys are still under observation. Feeding experiments with insects had to be abandoned owing to the climatic conditions proving adverse to maintaining insects viable for longer period than four days.

(b) **VITAMIN "A" PROPHYLAXIS FOR CEREBROSPINAL MENINGITIS**
(by Dr. N. L. Corkill).

In 1934 an epidemic of a severity hitherto not experienced swept Eastern and Central Kordofan and, when it closed with the advent of the rainy season, its spread had reached the neighbourhoods of Dilling and Heiban.

A further epidemic affecting the whole Nuba area was forecasted for the next dry season (commencing October, 1934) on three grounds, (a) the dispersal of carriers on the abolition of the quarantines (b) the lack of recent meningitis experience in the population as a whole and (c) the economic depression since 1931 coupled with an apparent neglect of food crops by the Nubas for the more attractive money crop of cotton, the growing of which had developed at a phenomenal rate.

On account of (c) it was decided to attribute the unprecedented severity of the 1934 epidemic to subnutrition and to apply an experiment to assess the value, if any, of Mellanby's "anti-infective Vitamin "A" as a prophylactic.

The expected epidemic occurred, the vitamin concentrate Essogen was procured and two experiments were conducted.

The first two cases occurred in Heiban Mission which numbered about 100 individuals, mostly school children. They were divided into two comparable experimental groups, the members of one of which were medicated with Essogen daily. No further cases occurred in either group though cases continued to occur in Heiban Town and the neighbouring villages.

In Dilling area, when the epidemic was in full swing, five communities were medicated and seven other comparable communities were observed as controls. Essogen was given to juveniles only.

In four out of five of the medicated communities the epidemic closed abruptly (the incidence curve being the criterion); in the fifth it was subsequently revealed that only 6% of the juveniles were being medicated. In the seven control communities the epidemic closed in two, flickered on in three and raged in two.

After a month Essogen was discontinued in the first four, continued in the fifth and started in the two previous control communities in which the disease was now raging. There were thus left as controls five of the original seven control communities. In the two newly-medicated communities the incidence curve dropped abruptly in a sharp descent; in the control communities, as a whole, the disease flickered on.

The results were thus inconclusive but favourable rather than unfavourable to the drug being of value.

There is, however, a further point in its favour. The incidence rapidly declined in medicated communities as a whole, as compared with the controls as a whole, but the mortality rate in the medicated was greater than that in the controls, the explanation probably being that persons, on the border line of susceptibility were saved from infection by vitamin and thus mortality became more concentrated in the marasmic remainder. Now, on analysing the data amassed during the epidemic, it was found that, when incidence increased, but mortality decreased, a factor was at work increasing susceptibility and, conversely that, when incidence decreased, but mortality increased a factor increasing susceptibility was being removed. Assuming this to be a valid law and applying it to incidence and mortality comparisons as between the medicated and the control groups, it is seen that, in the former, a factor increasing susceptibility was being removed; this factor would appear to be a deficiency of Vitamin A.

Viewing these results in academic isolation, they do not constitute a strong case for the use of Essogen. Viewing them in relationship with what is known of the diet and diseases of Sudanese and what has been published, they form a practical justification for further experiment and the immediate adoption of the routine use of a vitamin A concentrate in outbreaks of meningitis and pneumonia amongst prisoners, troops and institutions of the nature of schools.

(c) **FILARIASIS (By Mr. H. M. Woodman).**

As noted in previous reports *O. volvulus*, *A. perstans* and *L. loa* are all endemic in the Li Rangu area. It is probable that *W. bancrofti* also occurs, but so far, and in spite of continuous systematic search, it has not yet been identified.

Onchocerciasis occurs infrequently in this area. In 1935, only four cases of onchocercal nodules were diagnosed, and one case of the so called typical blindness. In each of the former, the worm itself was demonstrated. In the Northern and Western Bahr el Ghazal the disease is widespread and of major public health importance.

A. perstans occurs, but as recognised elsewhere, appears to be non-pathological.

L. loa is by far the most important of these parasites in this region. 38% of men and 20% of women admitted to hospital have mf. *loa* in the blood.

In all cases of organic filariasis such as elephantiasis, enlarged glands, and hydrocele, mf. *loa* or *perstans* have been demonstrated in the tissues and frequently either or both have been shown to be present in the blood.

Difficulties in technique are encountered in the staining of tissues which do not arise in the case of blood slides. Consequently it is not always possible to obtain a clear enough view of the minute anatomy to distinguish mf. *bancrofti* from mf. *loa*. But in view of the fact that neither here nor in the Stack Laboratories has the presence of *W. bancrofti* been established, it appears unlikely that this parasite is the exclusive cause of organic filariasis.

23% of British and Syrian Officials are infected with *L. loa*. The incidence is reported to be even higher amongst Europeans in the Northern Belgian Congo.

It is hoped that a number of details regarding blood counts and periodicity, will form the subject of a paper to be published at a later date. Meanwhile the following notes are of interest:—

32% of inpatients infected with mf. *loa* have enlarged glands, hydrocele or elephantiasis.

In another sample of the native population, taken at random, and in whose blood mf. *loa* was found to be present:—

33% had enlarged glands.

5% had Calabar swellings.

5% had elephantiasis.

0% had hydroceles.

57% had no visible lesion.

In 11 cases, the adult *L. loa* was seen crossing the conjunctiva.

Of 6 cases of Calabar swelling only one had mf. *loa* in the blood.

A diagnosis of *L. loa* infection was made only if on examination of carefully stained slides there was found to be present a microfilaria morphologically indistinguishable from mf. *loa*.

The youngest case was only 4 years, the eldest 56.

Periodicity.

Examination of slides showed that the microfilaria is not diurnal in the peripheral blood. Night slides were taken in 72 cases. In some instances the microfilariae were present in equal numbers at all hours, but usually, fewer were seen at 9 p.m., sometimes none at all at 10 p.m. while they appeared again at 12 p.m. In only 9% of cases was the microfilaria entirely absent up to 12 p.m.

On an average a thick blood slide revealed the presence of less than one microfilaria per field under a $2/3$ lens.

The maximum average observed was 57, and in another case 31.

A. perstans and *L. loa* were present in the proportion of 23 to 77.

The Blood.

All cases showed a polymorphonuclear leucocytosis.

Maximum 33,750 (eosinophilia 30%)

Average 14,000

All cases, except two, showed an eosinophilia.

Maximum	{	in a Zande	43 %
						in a British	73 %

Average	13 %
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The Vector.

Chrysops is the only known vector of *mf. loa*. At least 3 species have been collected and forwarded for identification. Over 100 specimens have been taken from the Li Rangu, Meridi, and Source Yubo areas separately. They have been preserved in Carnoy's fluid and alcohol, and arrangements have been made for their dissection.

The maximum distribution of *L. loa* does not appear to correspond with that of *Chrysops*. The determination of the percentage of infected *Chrysops* would be of the greatest significance. In West Africa this is said to be 3.5%. A lower infection rate would lead one to suspect the presence of other vectors.

A comparison of the infection rate of *Chrysops* in the three areas with the incidence of loasis would provide further valuable evidence.

It seems probable that some other vector is present. This may be a Tabanid, *Stegomyia* or a common *Culex*. Of the latter, one of the *Stegomyia aedes* (probably *vittatus*) seems the most likely. Of the mosquitoes so far identified this is the commonest, and is a day and night biter. It is moreover a cousin of *Aedes variegatus*, which is responsible for non-periodic filariasis in the Pacific.

Of the known vectors of *W. bancrofti*, *A. gambiae* is the only one which has so far been identified in this area.

Recently in New Guinea it has been shewn experimentally that 70% of *A. punctulatus* will carry *W. Bancrofti*.

Similar experimental work on mosquitoes of this area appears to be the quickest means of identifying new intermediate hosts for *L. loa*.

Conclusion.

- (1) Loasis in this area differs in certain points from the disease as described in West Africa.
- (2) It is possible that we are dealing with a new microfilaria, partly confused with *L. loa*.
- (3) The extent to which certain pathological conditions can be attributed to, or associated with this filaria remains to be investigated.
- (4) An intermediate host other than *Chrysops* probably exists.

REPORT

OF

STACK MEDICAL RESEARCH LABORATORIES.

BY DR. E. S. HORGAN.

The Stack Medical Research Laboratories built in 1927/28, as a memorial to the late Sir Lee Stack, formed the Bacteriological unit of the Wellcome Tropical Research Laboratories organisation. With the retirement of the Director and the subsequent decentralization, the Laboratories became an integral part of the Sudan Medical Service from 1.4.1935 forming the nucleus of the present Laboratory Services. Owing to the considerable administrative changes which have taken place, a brief sketch of the present organization will be given. The activities of the Laboratories may be classified under three main heads :—

RESEARCH.

Having been incorporated in the Sudan Medical Service, it is proposed, in the future, not to regard the Laboratory as a detached organisation, but to collaborate with the Medical Service, as a whole, in more extensive field operations. The first problem to receive attention along these lines will be malaria in the Gezira in relation to which an entomological survey has already commenced.

ROUTINE ACTIVITIES.

These may be divided into (a) routine examinations of specimens, and (b) preparation of vaccines specially, Rabies, T. A. B. and Cholera. Routine specimens are sent in from all parts of the Sudan but as might be expected a considerable proportion of such come from the Khartoum—Omdurman thickly-populated area. A recent feature is the large and steady increase in specimens sent in from provincial hospitals and dispensaries, while the total examinations have doubled within the last five years. There is sometimes a certain tendency to lay undue emphasis on an increase of routine examinations in evaluating the efficiency of a Tropical Research Laboratory. Such increases are no doubt very gratifying but there seems a certain risk in allowing them to choke the essential research activities of such a Laboratory.

In a country like the Sudan the fundamental importance of short range research demands a close liaison between it and routine examinations, the latter forming its raw material but at the same time it is equally important to hold a balance between them. The increase of routine work in the Laboratory for the past five years has been an inevitable feature of the expansion of medical activities through the Sudan but it is hoped in the near future, by raising the standard of the small hospital laboratories through the country, to decentralize considerably the volume of such work, in particular the simpler examinations of clinical pathology, and so leave the central Laboratory more opportunities to deal with the important or difficult tests and the problems arising therefrom.

Another point in the work of a tropical laboratory which seems to have received insufficient attention, is the statistical significance of negative results. It is perhaps not fully appreciated by home workers that the standard routine methods often give very misleading and fallacious results in tropical conditions and hence an important element in routine research is the elaboration and the application of more accurate methods.

It will be the practice in these reports to record any such methods found of value and in cases where the standard methods are suspected of giving unsatisfactory results the point will be mentioned.

EDUCATIONAL.

(a) Improved Training of Sudanese Laboratory Assistants for the hospital laboratory service.

For some years past, it has been the practice to send intelligent hospital orderlies to the Laboratory for training in the simpler routine tests and after a period of tuition to send them out to the various provincial hospitals. Owing to the increasing demands for such assistants, it was not always possible to give a sufficiently full course and frequently the candidates sent in were most unsuitable for laboratory work.

The present service of Sudanese laboratory assistants has been organized as follows. Every member of the existing service will undergo a full course of training for the Stack Laboratories irrespective of the length of time he has already been in the Medical Service. The period of tuition proposed is at least four months. Their present educational standard is somewhat varied but all can read and write Arabic, a few have a good primary school education, and some have a certain knowledge of English. Tuition is carried out in Arabic by the British Laboratory Assistants under the superintendence of the Assistant Director of Laboratory Services and is entirely practical. The course is divided into two sections (i) clinical pathology on which at least three months must be spent, special emphasis being laid on parasitological examinations of blood, faeces and urine, and the common bacteriological staining methods viz. Gram's Neissers, Ziehl-Neelsen, etc. (ii) a practical course in the methods of dealing with infected materials; use of antiseptics, cleaning glassware, plugging tubes making swabs and capillary pipettes, sealing ampoules, etc. This part is demonstrated by the Head Sudanese Laboratory Attendant under the direct supervision of the Senior British Assistant. At the end of the course, a practical examination is held by the Assistant Director of Laboratory Services, and successful candidates recommended to the Director, Medical Service for promotion as classified officials. Failure to pass will generally be taken as evidence of unfitness for such work and the candidate will not be retained in the Laboratory Services.

To ensure the maintenance of this standard as far as possible, all Sudanese assistants will be brought back in due rotation for "refresher" courses.

Hospital Laboratories. The equipment is being standardized, all stains, reagents, etc. being the same as those used in the Stack Laboratories and issued in solution, as it has been found by experience that the local preparation of stains such as Leishman's is quite hopeless.

(b) Teaching of Medical Students. The Stack Laboratories are in close association with the Kitchener School of Medicine and, in addition to courses in Pathology, Bacteriology, and Parasitology, given by the bacteriologists, a

small pathological museum is maintained. Post-Mortem demonstrations are also given, but, owing presumably to local prejudices, the number of autopsies is lamentably small and their rarity remains a weak feature in the education of the Medical Students. An attempt to lessen the difficulty is being made by increasing the number and variety of unmounted pathological specimens which can be handled by the students. It is not pretended that this is an efficient substitute for fresh post-mortem specimens. Furthermore, owing to the high temperature in Khartoum for a large part of the year, the preservation of mounted or unmounted specimens is a task of considerable difficulty and no really satisfactory method has yet been found for the preservation of colour.

ROUTINE EXAMINATIONS.

PATHOLOGICAL SPECIMENS. The total for the year was 435.

POST-MORTEMs. 23 were carried out in Khartoum Civil Hospital during the year of which 9 were medico-legal.

NEOPLASMS. 119 were received of which 30 were benign and 89 malignant.

A list of the malignant tumours is appended.

ORGAN OR TISSUE.	Carcinoma.	Sarcoma.	Total.
Breast	9	1	10
Female Genitals	6	0	6
Male Genitals	4	0	4
Kidneys	2	0	2
Mouth	1	2	3
Salivary Glands	3	0	3
Liver and Gall bladder	2	1	3
Spleen	0	1	1
Lymphatic Glands	4	5	9
(secondaries)			
Skin	14	1	15
Sole of foot	5	0	5
Eye and Orbit	5	1	6
Subcutaneous tissue, fascia, tendons	0	12	12
Nerves	0	3	3
Bone	0	1	1
Site unknown	2	4	6
	57	32	89

Comments. This conventional classification of carcinomata and sarcomata is adopted solely for convenience, and included under the former head are 5 melanomata which many workers would prefer to class as sarcomata. Included with the sarcomata are certain fibromata or neuro-fibromata in which, although their general histology was that of a benign neoplasm, certain suspicious changes were encountered.

Sex and Age of patients. Males are in the great majority which is simply indicative of the fact that at present men seek hospital treatment far more frequently than women. In only a few specimens sent in was the age noted.

Seats of election. Sole of foot. Included 5 melanomata and 1 sarcoma (a neuro-fibro sarcoma).

Attention has been recently drawn by several workers :

Smith E.C. and Elmes B.G.T. —1934—Annals of Tropical Medicine and Parasitology—Vol. 28—461

Hewer T. F. ... —1935—Journal of Pathology and Bacteriology—Vol. 41—3—473.

Horgan E. S. ... —1935—Lancet—Vol. 2—156.

to the frequent occurrence of melanomata of the leg, and especially of the sole of the foot, and their relation to trauma in natives of Nigeria and the Sudan. It is interesting to note that the figures in the present report once again show the sole of the foot as the predilection site of this tumour, since in addition to the 5 from this site only one other, from the eye, was reported. If the lower third of the leg is considered with the foot this region was the site of 13 malignant neoplasms including 1 rodent ulcer, 3 squamous epitheliomata and 4 sarcomata in addition to the above melanomata. These tumours were all reported from the anterior tibial region which again suggests the possibility of trauma as a factor.

Cutaneous Epitheliomata. In spite of the carefully collected figures of Smith and Elmes (quoted above) and other workers there still appears to be an impression that cutaneous cancers are rare in Africa. The present figure show a total of 14, 4 being rodent ulcers (basal epithelioma) and the remainder squamous epitheliomata. Excluding those on the leg the remainder occurred on the face and scalp.

One squamous epithelioma was removed from a case of xeroderma pigmentosa—a disease which does not appear to be very rare in the Sudan.

Eye and Orbit. (6) Three were glio-sarcomata in children, 1 a typical squamous cancer, 1 spindle celled sarcoma and 1 melanoma.

Kidney. (2) One hypernephroma and 1 adenocarcinoma.

Ailmentary Tract (excluding liver). With the exception of the mouth no neoplasms (benign or malignant) were recorded during the year, a finding which accords with the usual Sudan experience where cancer of the stomach or intestines is excessively rare.

In view of the comparative frequency of intestinal schistosomiasis in the northern Sudan, it is rather curious that intestinal cancers appear to be so rare.

Lymphatic Glands. Under the heading of sarcoma are included 3 cases of Hodgkins disease. It was not possible to carry out the biological test.

RABIES.

148 brains from all parts of the Sudan were examined during the year of which 4 arrived completely decomposed and thus useless for examination. An analysis of the remainder shows the following figures :

62 were positive for Negri bodies, the distribution from rabid animals being 54 dogs, 6 donkeys, 1 camel, and 1 fox. The negative included 73 dogs, 4 donkeys, 1 camel, 1 monkey, 1 goat, 1 cat and 1 human.

The last is of some interest. The patient, a native woman, was badly bitten by a dog on the thigh. The dog was killed and the brain was reported negative. The patient who did not seek treatment for 25 days was admitted to hospital with a gangrenous ulcerating wound and received the usual course of anti-rabic treatment. On the 18th. day after admission, she was said to have been unable to swallow water. There was no paralysis, reflexes were normal and no other symptoms were noted. The following day death took place and the brain was sent to the Laboratories. In view of the previous negative finding, sections were made from different levels of the brain, including medulla, pons, mesencephalon, hippocampus and cortex. In no case was a Negri body found and there was no perivascular infiltration or any other evidence of encephalitis. Demyelination was also absent and the brain appeared histologically quite normal. Thus there is no evidence whatever, that either rabies or anti-rabic treatment was concerned in causing death which seems to have been a direct consequence of the gangrenous wound.

Method of Diagnosis. Only the histological method is used, viz. examination of sections of the hippocampus for Negri bodies. The brains are received in 5% formalin and by the use of the quick acetone fixation method the sections are ready in 24 hours. After trials with many staining methods, a slight modification of Leishman has been found to give, on the whole the best results. Animal inoculation (rabbits) was discarded years ago as a routine measure, partly on account of the long and irregular incubation period in the local laboratory strains of rabbits and partly because the brains frequently arrived grossly contaminated in spite of being sent in glycerine and when inoculated usually killed the rabbits from some septicaemic condition.

Rabies Vaccine. Preparation and issue. 32725 c.c.s. were issued during 1935. Several alterations in the technique of preparation have been made since 1934. In view of the more favourable statistical results of the Paris virus over any other strain used for vaccine in the Kasauli Institute, a specimen of the virus was obtained through the courtesy of Dr. Stuart, Director, Public Health Laboratories, Jerusalem.

Routine vaccine is now prepared from the Paris virus, sheep being substituted for rabbits as recommended in the Indian Medical Research Memoirs 1934 No. 21 and the strength of the vaccine has been increased from 1% to 2.5%.

The method recommended in the Memoir (quoted) for making emulsions by shaking up with glass beads has given most excellent results.

Rabies Research. Staining methods.

It is doubtful if any of the usually recommended methods give altogether satisfactory results with formalin fixed brains.

The value of formalin however in a country like the Sudan lies in the ease with which a solution can be prepared, as it is supplied to all hospitals and dispensaries as an ordinary issue. Consequently, attention has been devoted to methods which will give the best histological differentiation with formalin fixed brains. Trials are now being made with the Safranin-Fuchsin method of Lépine (Comptes Rendus des Séances de La Société de Biologie 1935—119—23—804) which is claimed to give excellent results for demonstrating Negri bodies.

Owing to the suggestive results of several recent workers, that the mid-brain or medulla is more suitable for examination for Negri bodies than the usual hippocampus an investigation is now being made into this point on all brains received for routine examination.

YELLOW FEVER.

Survey work was continued in two directions :

1. Examination of livers—Routine instructions have been sent to all Senior Medical Inspectors in the southern and western Sudan to send in specimens of liver from as many cases as possible of jaundice or fever of unknown origin dying within 8 or 9 days. Viscerotomes as recommended by Dr. Soper of the Rockefeller Foundation have been supplied to all important stations in the South and have proved of great value in obtaining specimens of liver from cases where a post-mortem was refused.

During the year 30 specimens of liver were received—29 of which were negative for yellow fever.

The following was the only suspicious case and serves well to illustrate the difficulty of diagnosis in a doubtful case from a viscerotome specimen of liver and the possible fallacies that may arise through the sole use of this method.

The history of the case was as follows —:

Patient a male about 25 years of age who came direct to Malakal from Liri Nuba taking 4 days on the journey. He remained well for 16 days and then complained of severe epigastric pain and vomiting. Three days from the onset of symptoms he was admitted to hospital with intense jaundice and in a comatose condition. There was no fever while he was in hospital nor history of any before admission, nor did he vomit while in hospital. Spleen and liver not enlarged. Blood slide negative for malarial parasites but positive for *Filaria Bancrofti*. Urine contained albumen(++), blood(++) and ova of *S. haematobium*. Cerebro-spinal fluid showed no abnormalities. After $2\frac{1}{2}$ days in a comatose condition he died. An autopsy being refused, only a viscerotome specimen of liver was taken. Examination of this (31.12.1935) showed a widespread fatty degeneration of moderate degree and areas of eosinophil necrosis. These areas were not definitely mid-zonal. What appeared to be Councilman bodies were present and certain of the nuclei showed suggestive changes.

Owing to the suspicious changes in the liver, the slide was sent to Dr. G. M. Findlay, Wellcome Bureau of Scientific Research, London for his opinion.

He reported as follows :—

“ The liver slides which arrived yesterday were extraordinarily suggestive of yellow fever and had they come from a case in West Africa or one with a more suggestive clinical history, I should have had little hesitation in saying that they were from a case of yellow fever. If the history is correct and the man was only ill a short time, the intense jaundice is not characteristic of yellow fever. It usually only comes on in yellow fever cases about the 8th or 9th day. The absence of temperature is also peculiar, though it is difficult to imagine that such extensive necrosis could occur in the absence of all fever. There are quite a number of Councilman lesions in the liver and also I think, intranuclear inclusions. If you have kidney, heart and spleen I should very much like to see them : also are any notes available as to the condition of the stomach ? Black vomit, though not always present, is very suggestive of yellow fever.”

Taking all factors into consideration, it seems extremely doubtful if the case was one of yellow fever, in spite of the suggestive histological appearances.

2. Collection of sera for mouse-protection tests.

The serum is pipetted off and sent in sealed ampoules to the Laboratories where it is forwarded on to Dr. G. M. Findlay for the mouse-protection tests.

It might be mentioned that, owing to strong recommendations, Behring's venules were first tried but proved completely useless, the blood becoming rapidly haemolyzed and arriving as a thick syrupy fluid useless for any serological test.

Serum from 29 cases was sent to London, of which 9 showed protection ; 8 of the positive cases were from the southern Sudan, and 1 from Wad Medani. Investigation of the last showed that the patient was a cattleman from the western Sudan and the result therefore is of little significance. The Laboratories are deeply indebted to Dr. Findlay for carrying out such tests and for his expert advice on doubtful sections of liver submitted to him.

CASES OF JAUNDICE OF UNKNOWN ETIOLOGY.

During and previous to the yellow fever survey of the past two years, numbers of cases of a clinical syndrome of unknown origin have been reported. The symptoms are usually moderate fever (in most cases), deep jaundice, vomiting in some cases, Albuminuria is usually present but, in most cases, appears to be of slight degree. In some of the fatal cases leucocytosis (polymorphonuclear) is present, in one fatal case the white count shortly before death being 50,000 per c.mm. but this is unusual. A considerable number of such cases died, but, as it is very difficult to obtain any reliable record of the total number of cases, it is impossible at present to say if the mortality is high.

Pathology. All examinations of blood, urine and faeces have been negative. Mouse-protection tests have also given negative results. On several occasions it has been possible to investigate small outbreaks more fully and the possibility of leptospiral infections has been borne in mind but in no case have leptospirata been isolated, and adhesion tests, kindly carried out by Major H. C. Brown of the Wellcome Bureau of Scientific Research, have always been negative.

Pathological lesions. The microscopic appearances of the liver are very variable and often appear to bear no relation to the intensity of the jaundice and other symptoms. As a rule however there is well-marked necrosis, in some cases so extreme that all semblance to liver structure is lost. Haemorrhagic changes are uncommon and infiltration of the portal tracts and necrosed areas by lymphocytes is variable. Fatty changes are rare and there is no eosinophilic degeneration of the cytoplasm of affected liver cells. The spleen is usually greatly congested and in some cases, there is a central necrosis of the Malpighian bodies. The kidneys are often congested and show changes in the convoluted tubules ranging from a cloudy swelling to a definite necrosis of the epithelium ; the latter is, however, uncommon. Bile staining of the necrosed tubules may be present.

The resemblances especially in the liver between these cases and cases of an obscure infective disease associated with jaundice occurring in Nigeria (Beeuwkes, Walcott, Kumm, and Hudson. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1930/31—Vol. 24—P. 429), have often been noted but until something more is known of the etiology of the Sudan cases further speculation on this point is profitless.

Kala-Azar. Since the discovery by Forkner and Zia (1934 Journal of Experimental Medicine—Vol. 59 No. IV. 491) of the occurrence of Leishman-Donovan bodies in nasal and tonsillar swabs, these are being examined as a routine diagnostic procedure. Positive results are frequently observed even in early cases where serological tests as the formol-gel are negative but the value of the operation is at present sub-judice.

Cerebrospinal Meningitis. During March, 1935 the writer was able to pay a short visit to the epidemic zone in the Nuba Mountains and a number of cultures of meningococcus isolated from the cerebro-spinal fluid were brought back to Khartoum for further examination. Emulsions were put up against Group I and II sera (Standards Laboratory Oxford) and the results showed considerable overlapping. All strains were agglutinated to a variable extent by both Group sera, the titres being low and never exceeding 1 in 125. On the whole agglutination by Group I serum was more complete in 24 hours but with most of the strains there was little difference. A few absorption tests were carried out; the results showed a similar antigenic overlapping. Several strains were isolated about the same time from sporadic cases in Abu Usher and Wad Medani, all of which gave similar results to the epidemic strains.

Enteric Fever. As usual the majority of the cases were due to *B. typhosus*. *B. paratyphosus* B. seems to be almost unknown amongst Sudanese, the few positive cases for years past occurring in British soldiers or officials.

Blood cultures. There has been a very encouraging increase in the number of blood cultures sent in for early diagnosis of enteric fever.

Widal Reactions. Dreyer's macroscopic technique is used and all sera sent in are put up against the following emulsions *B. typhosus* "H" and "O," *paratyphosus* A—"O," *Paratyphosus* B—"O" and *B. melitensis*.

After an extensive series of cases in which Widal's of proved enteric cases (by blood culture) were examined, it has been found that the above emulsions are quite sufficient for all routine purposes. In the Sudan where all officials and large numbers of natives have been inoculated with T. A. B. vaccine, great emphasis is laid on the importance of carrying out a Widal as early as possible in suspected cases of fever to establish a "threshold" value for "O" agglutination; the standard practice being to take blood for a Widal at the same time that a blood culture is being carried out.

In view of Felix's recent work on the Vi antigen and its relation to inagglutinable strains, all *Salmonella* organisms isolated from blood culture for the past 18 months have been examined for agglutinability ("H" and "O"). At the time of writing this report a strain of *B. typhosus* has been isolated from a child which falls into the category of so-called "inagglutinable strains." Preliminary tests have shown that it is agglutinated to end point by a high titre pure Vi serum and the strain is now being further investigated. It is interesting to note that the case clinically is a very severe one.

T. A. B. Vaccine. It has been the practice of these Laboratories for some years to use comparatively freshly-isolated strains for the preparation of vaccines, but, in view of Felix's observations on the importance of the Vi antigen, its labile nature and its destruction by 0.5% Phenol etc., work is now in progress to discover if possible some method of preparation of vaccine in which the Vi antigen would be unimpaired.

Inagglutinable strains have been kindly supplied by Dr. Felix, Lister Institute and Major H. J. Bensted, R.A.M.C.

Isolation of *B. typhosus* in faeces and urine. Since the beginning of 1935 Wilson's Bismuth-Sulphite recent modification (1933 British Medical Journal II. 560) has been substituted for McConkey's medium which had given consistently bad results with or without Brilliant Green enrichment. The reasons for its failure have been discussed in a recent paper (Horgan E. S.—1935 Journal of Hygiene Vol. 35.138). Since its adoption Wilson's

medium has continued to give excellent results and faeces from cases or carriers can now be sent in from many outstations and positive results can be obtained from faeces even after 2 or 3 days' delay.

Various methods such as Teague and Clurman recommended for the preservation of typhoid bacilli in faeces have been tried in these Laboratories ; all were equally worthless.

Bacillary Dysentery. McConkey's Medium gives excellent results in acute cases with freshly-passed faeces, but for the isolation of the organisms from carriers, it has always given most disappointing results in these Laboratories, and in our experience, the value of negative results in the examination of suspected carriers is most problematical.

Various so-called selective media have been tried from time to time, but their results are no better than McConkey's and in the writer's opinion, a true selective medium for dysentery baccili yet remains to be discovered.

WATER SUPPLIES.

Routine examinations are carried out periodically on the water supplies of Khartoum and Omdurman, and the more important provincial centres.

Tests are also carried out at frequent intervals for the Egyptian Irrigation Service at Gordon's Tree Dockyard and the water supplies which are being used during the construction of Jebel Aulia Dam.

Value of Chloramine for sterilization of well water.

While the value of chloramine for the sterilization of tanks etc. is well known there appear to be no records in the literature of its value in wells. During December, 1935 a series of experiments have been carried out in conjunction with the Medical Officer of Health and his staff, the wells selected being in the native quarter of Khartoum (Deims).

A summary of the results may be of interest :

Four wells were selected, their respective capacities when full being 100, 150, 500 and 600 gallons. The chloramines were formed by adding equal amounts of the trade preparation "Chlorosene" and ammonium chloride. The PH of all wells was in the range 7.4 to 7.7.

It was found that dilutions of 1 in 225,000 of the Chlorosene completely sterilized within an hour, the water remaining sterile for 3-4 hours. With dilutions of 1 in 112,000 the water was still sterile after 7 hours. There was a slight taste in the water for two or three hours after the addition of the chlorosene.

The method may have considerable practical value in certain cases.

Bacteriological Standards for Water Supplies in the Sudan. The following represent the general conclusions reached in these Laboratories.

(a) Filtered and Chlorinated supplies. The standard methods can be applied as a whole ; the ratio of the total counts at 37° C. and 22°C. as an index of pollution is of little value ~~supplied~~ to Sudan waters.

(b) Wells and river waters ^{as applied} (untreated). The pessimistic admission must be made that neither the accepted home standards nor standards devised to suit local conditions provide any accurate information as to the purity or otherwise of waters.

In a country like the Sudan where *B. lactis aerogenes* and “intermediate” coli types as well as *Ps. pyocyaneus* are frequently encountered in faeces as well as being almost ubiquitous organisms in water or soil the value of selecting typical *B. coli* as an index of faecal pollution is greatly impaired. In the experience of these Laboratories extending over many years none of the host of methods recommended for the differentiation of faecal from non-faecal types of coli has proved of sufficient value to be used as a routine standard.

To sum up (1) Isolation of typical *B. coli* (judged by the five tests, fermentation of lactose, Voges-Proskauer, Citrate, Indol, and Methyl Red) is as elsewhere always significant of faecal pollution human or animal (2) Isolation of *B. lactis aerogenes*, intermediate coli types, or *Ps. pyocyaneus*, as is the far more common experience, gives no information as to the degree of pollution of the water.

To avoid misapprehension it should be emphasized that these observations are only intended to apply to waters in the Sudan.

VACCINE LYMPH. All vaccine lymph used in the Sudan is purchased from abroad but, owing presumably to difficulty of storage in transit during hot weather, the results of vaccination cannot be regarded as wholly satisfactory, and experiments are now being carried out with a view to establishing a vaccine lymph institute in Khartoum.

Summary of work. During April and May, 1935 3 calves, zebu strain were vaccinated with seed lymph (monkey) of high potency which was kindly supplied by Dr. H. J. Burke-Gaffney, Dar-es-Salaam. Of the resulting lymphs the potency of two might be regarded as fair and one as bad.

After 6 months' storage at -10° C. the potency had not materially altered but the bacteriological content was still very high although streptococci or gas producing anaerobes were not isolated.

As these lymphs were made during the hot, dusty weather, it is possible that better results might be obtained from lymphs prepared during the cold weather and further trials are now in progress.

While on leave, the writer was, through the kindness of the Director, Col. W. D. Stevenson, afforded an opportunity of visiting the Government Lymph Establishment, Hendon, and studying the methods there employed.

SUMMARY OF ROUTINE EXAMINATIONS.

Blood—Kahn's Test ...	9,320	Faeces and Urine ...	...	2,827
„ Widal Reaction	896	Throat swabs—Diphtheria positive		95
„ Cultures ...	526	„ „ „ negative		1,235
„ Films ...	653	Sputum T. B. positive		16
Cerebro-Spinal Fluid ...	79	„ „ negative		86
Biochemical ...	65	Pathological Histology ...	...	435
		(including examination of brains for Rabies)		
		Miscellaneous ...	...	253
TOTAL		16,486		

Summary of Faeces Tests.

Flexner	...	...	...	14
Shiga	...	...	...	7
Flexner Y	...	...	...	24
Typhoid	...	...	...	154
Amoeba	...	...	...	24
Ova	...	...	...	77
Schmitz	...	...	...	7
Negative	...	...	...	1,418
TOTAL				1,725

Summary of Urine tests.

Typhoid	...	...	...	118
Paratyphoid A	...	...	...	1
Ova	...	...	...	9
Negative	...	...	...	974
TOTAL				1,102

Summary of Widal Tests.

Typhoid	...	...	...	185
Paratyphoid A.	...	...	...	2
Melitensis	...	...	...	20
Negative	...	...	...	689
TOTAL				896

Summary of Blood cultures.

Typhoid	...	...	...	115
Paratyphoid A.	...	...	...	5
Melitensis	...	...	...	1
Streptococcus	...	...	...	9
Other organisms	...	...	...	11
Negative	...	...	...	385
TOTAL				526

Summary of Malaria Examinations.

Benign tertian	...	...	...	...	...	...	...	26
Subtertian	...	...	...	...	...	...	...	62
Quartan	3
Double infection	2
Negative	560
TOTAL				653

Kala-Azar	16	Rabies	148
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The following vaccines were issued during the year :—

Typhoid—Paratyphoid	4,500 c.c.
Anti-Rabic	...	...	...	...	...	32,725 c.c.
Gonococcus	...	...	...	...	...	3,750 cc..
Staphylococcus	...	...	...	...	...	615 c.c.
Cholera	...	...	...	...	...	2,500 c.c.
TOTAL				...	...	44,090 c.c.

REPORT

ON

MEDICAL ENTOMOLOGY

BY H. W. BEDFORD.

GOVERNMENT ENTOMOLOGIST.

AGRICULTURE RESEARCH SERVICE.

1. Introduction. The present year has witnessed the reorganisation of Medical Entomology in the Sudan. In the past this branch of Applied Entomology has been carried on by various members of the Entomological Section who were detailed for specific problems as they arose. Through the close co-operation of the staff of this Section together with the ever ready assistance given by the Sudan Medical Service and others interested, a representative type collection of mosquitoes and other insects of medical importance has been built up and considerable data accumulated concerning their distribution and habits.

When in April, 1935 the reorganisation of the services dealing with scientific research in the Sudan took place, the Entomological Section was reconstituted under the newly-formed Agricultural Research Service. A special sub-section was created to deal with all problems pertaining to Medical Entomology, and staff from the Entomological Section was detailed for duty with the Research Section of the Sudan Medical Service. Mr. F. G. S. Whitfield who had since 1930 held the post of lecturer in Biology at the Kitchener School of Medicine and the Gordon Memorial College was appointed Medical Entomologist and placed in charge of this Sub-Section.

In addition to continuing his duties as lecturer he is responsible for all work dealing with Medical Entomology and will co-operate closely with the entomologist newly appointed for mosquito research in the Gezira.

The latter post was created primarily for the study of the mosquito problem in the Gezira Irrigation Scheme with a view to effecting greater efficiency in control. Mr. D. J. Lewis who was appointed in November to fill the post has until recently been employed by the Rockefeller Institute in connection with anti-malarial research in Albania.

As Mr. Whitfield could not be spared to undertake his new duties until August and Mr. Lewis did not arrive in the Sudan until towards the end of November, little progress has been made under the new organisation.

The present report contains a resume of Medical Entomological work carried out by various members of the Entomological Staff during the current year.

2. Survey of insects of Medical Importance. The determinations of insects of medical importance received from various parts of the Sudan has been continued.

(i) **MOSQUITOES (Culicidae):** Specimens received for determination from outstations have been far fewer than during the previous two years.

These have included one collection comprising 63 specimens from Juba, numerous specimens from Wau, the majority of which were not in sufficiently good state of preservation for determination, and 14 specimens from Kassala.

A very interesting collection was made by Mr. W. Rutledge in Mongalla and the Upper Nile Provinces during the period August—October and numerous specimens have been obtained by the entomological staff in the Nuba Mountains.

Routine determinations of mosquitoes bred from larvae and pupae submitted by the Medical Officer of Health, Khartoum have been continued. Extremely few specimens have been received compared with the past three years, indicating that the past year in Khartoum has not been a serious one from the point of view of mosquito infection.

It is of interest to note that among recent determinations received from the British Museum (Nat. Hist.) is included *Aedes rhecter*, Dyar, a species not previously recorded from the Sudan. The specimen was obtained at Juba.

Mr. W. Rutledge, who, until April, 1935 has been responsible for the determinations of mosquitoes, has just completed a Guide to the mosquitoes of the Sudan, giving keys for the identification of species.

(ii) **SANDFLIES (Phlebotomus spp.)**

Until recently extremely little was known regarding the species of *Phlebotomus* to be found in the Sudan. Only three species were recorded namely, *Phlebotomus papatasi*, Scop., *P. africanus*, Newst. and *P. minutus*, Rond. var. *signatipennis*, Newst.

Owing to recent researches in connection with Kala-Azar, interest in this group has been stimulated due to the possibility that one or more species might prove to be vectors of this disease.

Large numbers have been collected by the staff of the Sudan Medical Service and Entomological Section from various parts of the Sudan during 1934 and early 1935, which have since been determined. These include in addition to the three species mentioned above which are widely distributed in the Sudan, the following:—

NAME OF SPECIES.	KNOWN DISTRIBUTION.
<i>P. Adleri</i> , Theo.	White Nile (Goz Khadra).
<i>P. Africanus</i> , var. <i>Sudanicus</i> , Theo. ...	Kassala (Aroma); White Nile.
<i>P. Affinis</i> , Theo,	Mongalla; Nuba Mountains.
<i>P. Congolensis</i> , Beq and Wahr.	Mongalla (Kapoeta).
<i>P. Congolensis</i> , var. <i>Distinctus</i> , Theo. ...	Mongalla; Nuba Mountains.
<i>P. Perniciosus</i> , Newst var <i>Langeroni</i> , Nits. ...	Mongalla (Kapoeta).
<i>P. Schwetzi</i> , A. T. and P.	Mongalla (Kapoeta); Wad Medani.
<i>P. Squamipleuris</i> , Newst.	Khartoum; Wad Medani; Mongalla.

It is interesting to note that, of the above species, the last-named is the only one contained within the "Major group," the group to which those species regarded in other countries as potential vectors of kala-azar belong.

Further additions to the collection of *Phlebotomus* have recently been made by Sir Robert Archibald. The specimens were collected during a tour in Southern Fung, but have not yet been determined.

(iii) TABANIDAE.

Chrysops spp. as possible vectors of microfilaria in the Bahr-el-Ghazal.

Numerous specimens of *Chrysops* spp. have been received for determination from the Yambio District of the Bahr-el-Ghazal, collected by Dr. Woodman and Mr. Rutledge in connection with work on loasis which is being carried out by the former.

The question as to the possibility of certain species of *Chrysops* acting as the vector of microfilaria in this part of the Sudan as in certain other parts of Africa is receiving attention. The majority of specimens received belonged to two species *Chrysops brucei*, Aust. and *Chrysops distinctipennis*, Aust. of the two, the former is by far the more plentiful in this region. It is unfortunate that no staff has been available for carrying out dissections of *Chrysops* spp. on the spot, with a view to ascertaining the degree to which they are infected by microfilaria, if at all. Owing to the very great difficulty of transporting specimens of Tabanids alive over long distances, the possibility of undertaking dissections in Khartoum or Wad Medani is remote.

3. Collection of insects from aeroplanes. The inspection of insects on arrival at Khartoum was started in August and is still being continued. The collection is of a very varied nature and includes a few mosquitoes, *Musca* spp. and various species of beetles and other insects, all of which will be determined in due course.

4. Breeding of *Wohlfahrtia nuba* for treatment of cases of osteomyelitis and septic wounds: The breeding of the fly *Wohlfahrtia nuba* has been continued throughout the year so that a supply of maggots should be available if and when required for treatment of hospital cases. During the year only 870 maggots have been required and issued to the Khartoum Civil Hospital as compared with 2,780 for the preceeding year.

5. Experiments for testing the efficacy of various insecticides used in houses for the destruction of flies and mosquitoes: The experiments started in 1934 have been continued. It would seem that there is no simple way of testing the efficacy of an insecticide of this nature, which can be regarded as likely to give reliable results. Experience has shown that a long series of tests is essential.

PROGRESS OF WORK.

Curative Medicine. The following figures show the number of inpatients, outpatient attendances, and operations performed during the last twelve years :—

YEAR.	Inpatients Admitted.	Outpatient Attendances.	Operations Performed.
1924	19,827	394,418	2,099
1925	22,809	593,014	2,565
1926	28,034	1,024,848	3,027
1927	33,407	1,457,706	3,445
1928	39,965	2,004,283	3,913
1929	46,033	2,675,085	4,337
1930	49,911	3,840,923	6,110
1931	59,763	4,044,439	6,798
1932	59,642	4,264,412	7,287
1933	70,315	5,092,999	8,609
1934	85,990	6,039,197	10,082
1935	89,093	6,112,303	11,124

Hospitals. The new Omdurman hospital for men is under construction, and sixty beds are already in use. When this hospital is complete, and a few additions to existing hospitals are made, the Sudan will have a hospital service adequate for its present needs, and as extensive as it can afford to maintain efficiently.

Economic development, however, may necessitate further extension in certain districts in the future.

Dispensaries. There are now 296 of these, and it is considered that this number is sufficient to bring medical aid within reasonable reach, and it is the maximum which can be adequately supervised by the existing staff. Only a few dispensaries, in most cases necessitated by economic development, will be opened in 1936.

Preventive Medicine. Considerable progress continues to be made in developing this important branch. The control of subordinate sanitary staff has been centralised, and their standard of efficiency raised. The creation of a useful and efficient cadre of Sudanese sanitary officers has enabled the British sanitary staff to extend their activities, and to undertake direct supervision of all provinces. This should be of immense benefit to the public health of the western and southern Sudan.

It is intended that a sanitary service shall be built up as soon as possible, as extensive in its ramifications and as well supervised, as the curative service is at present.

The difficult problems of village sanitation and housing are being dealt with.

Medical Research. In April, the Stack Medical Research Laboratories were amalgamated, and advantage was taken of the impetus this gave to research.

A scheme of malaria research, with special reference to the human carrier and to the mosquito vector in the Gezira and Khartoum districts, commenced in November. An entomologist was allotted for this work, under the supervision of Assistant Director, Laboratory Services, who has the full co-operation of the public health and hospital staffs in these districts.

Investigations regarding the aetiology of kala-azar are being carried out by Sir Robert Archibald, and yellow fever investigations are in progress.

BUILDINGS.

(a) New dispensaries were opened during the year at :—

Northern Province.

Dikka
Atbara
Um Breika
Hilgi
Aliab East
Tayiba El Khawad
Affat
Amentago

Blue Nile Province.

Debeiba
Lawni
Sennar Junction

Kassala Province.

Oyo

White Nile Province.

Dar es Salaam
Maatuk
Abu Rakuba

Kordofan Province.

Hammadi
Kilogi

Mongalla Province.

Loa
Lita
Lyria
Pini
Koggi
Larfone

(b) In addition to the usual minor alterations and additions, the following new buildings have been completed during the year :—

					Wards or Huts	
El Obeid	9	KORDOFAN
Delami	...	...	...	...	6
Tegali	...	...	...	...	5
Ghulfan	...	...	...	...	5
Shwai	...	...	...	...	4
Tabanga	...	...	...	...	4
Katla...	...	...	...	...	4
Heiban	...	...	...	...	3
Talodi	1	WHITE NILE
Dueim	...	...	...	...	1
Naima	...	...	...	...	1
Maatuk	...	...	...	...	1
Tayiba	...	...	...	...	1
Hafir	1	NORTHERN PROVINCE.
Halfa Dugheim	...	...	...	...	1
Rumbek	6	UPPER NILE
Tembura	1	MONGALLA.
Fasher	1	DARFUR.

Omdurman,—accommodation for 60 beds in the new male hospital.

Yubo,—laboratory and post-mortem room.

TRAINING.

Facilities exist for training the following categories of male medical and sanitary technical officials :—

Medical Officers.	Sanitary Officers.
Asst. Medical Officers.	Sanitary Overseers.
Asst. Radiographers.	Laboratory Attendants and Male Nurses.

In addition, a new course of training for dispensers will commence in 1936. It is anticipated that, by the end of 1937, eighty-six per cent. of the male classified officials in the Sudan Medical Service will be Sudanese. All unclassified officials, *i.e.*, hospital orderlies, etc., etc., have always been natives of the Sudan.

Midwives and Sudanese nurses are also being trained, but it will not be possible to substitute any of the non-Sudanese nursing or midwifery staff for many years to come.

Medical Officers. (*See* Kitchener School of Medicine Report page 86.)

Sanitary Officers. (*See* page 34.)

Assistant Medical Officers. Hospital orderlies, who are sufficiently well educated, and who have had considerable practical hospital experience, are selected for training as Assistant Medical Officers. After a twelve-months course which includes lectures in public health, theoretical, clinical and practical examinations are held. Those who reach an adequate standard are appointed Assistant Medical Officers and take charge of outlying dispensaries.

Laboratory Attendants (*See* page 70). The training of laboratory assistants has been re-organised as a result of the amalgamation of the Stack Medical Research Laboratories with the Medical Service, and, consequently, it was necessary to restrict the training to revision courses during the year.

Assistant Radiographers. Two were under training during the year.

Hospital Orderlies. A class of special training in nursing and hospital routine, for selected orderlies from outside hospitals, lasting six months, is held at the Khartoum Civil Hospital, annually, under the supervision of the Matron.

WOMEN.

1. **Nurses Training School.** 24 pupil nurses were under training during 1935, of whom 11 commenced the course in 1935 and 13 in 1934.

8 nurses passed the final examination in 1935, and were posted to hospitals.

2. **Midwives Training School.** (*See* page 56.)

KITCHENER SCHOOL OF MEDICINE.

ANNUAL REPORT.

BY MR. D. R. MacDONALD.

NUMBER OF STUDENTS.

No new students were admitted in 1935. The classes were composed as follows :—

Medical Students :—

2nd. Year	7
3rd. Year	5
4th. Year	7

Sanitary Students.

2nd. Year	3
3rd. Year	2

TOTAL	24
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(NOTE.—As no first year classes were held during 1935 the Biology, Chemistry and Physics Laboratories were used to train ten selected students from the Gordon College in Zoology, Chemistry and Physics with a view to their subsequent further selection as Medical, Sanitary, Agriculture and Veterinary students. These ten students were housed in the Hostel of the Medical School and received the same privileges as the Medical and Sanitary students).

TEACHING STAFF.

1. Dr. T. F. R. Hewer retired from the lectureship in Pathology and Dr. E. S. Horgan was appointed to the post.

2. Dr. E. S. Horgan retired from the lectureship in Histology, his place being taken by Mr. R. Kirk.

PROGRESS OF CLASSES.

Professional examinations were held in 2nd. and final year subjects.

2nd. YEAR EXAMINATION RESULTS.

Seven candidates were examined in Physiology. All candidates reached the required standard and will continue their studies in the 3rd. year subjects.

FINAL EXAMINATIONS.

The School was fortunate in obtaining the services of Sir Walter Langdon-Brown, M.D., F.R.C.P., late Regius Professor of Physic at the University of Cambridge, Consulting Physician to St. Bartholomew's Hospital, and Mr. C. H. Fagge, M.S., F.R.C.S., Consulting Surgeon to Guy's Hospital, Member of Council Royal College of Surgeons, as assessors in Medicine and Surgery respectively.

Seven students were examined in Medicine, Surgery, Midwifery, Gynaecology Pathology, Public Health, Forensic Medicine, Psychiatry and Pharmacology.

Five candidates were successful and will be posted to the larger hospitals in the Sudan as House-Surgeons and House-Physicians for one year on probation.

The successful candidates were (in order of merit) :—

El Bagir Ibrahim.
Ali Mohd. Nur.
Kemal Andrawis.
Ibrahim Suleiman.
Mahgoub Hamza.

Prizes were awarded as follows :—

Waterfield Prize in Surgery—El Bagir Ibrahim.

Medicine { El Bagir Ibrahim. }
Prize { Ali Mohd. Nur } Equal.

Atkey Prize in Public Health—Mahgoub Hamza.

PUBLIC HEALTH CURRICULUM.

During 1935 the course of lectures in Public Health was increased from 17 hours to 30 hours in order to approximate more closely to the curriculum at European medical schools.

BALFOUR PRIZE IN PUBLIC HEALTH.

A sum of money was generously presented to the School by Lady Balfour to endow in perpetuity a prize in Public Health, in memory of her husband, the late Sir Andrew Balfour. The first Balfour Prize will be awarded at the end of 1936.

CONTRIBUTION OF SIR SAYED ABDEL RAHMAN EL MAHDI, K.B.E., C.V.O.

The generous offer of Sir Sayed Abdel Rahman el Mahdi to contribute annually the sum of £E. 50 during 1935-38 inclusive towards the upkeep of the School was gratefully accepted by the School Council.

PRESENTATIONS TO THE MEDICAL SCHOOL.

The following presentations to the School were gratefully accepted by the School Council :—

1. A wireless set for the use of the students in the Students Hostel kindly presented by Dr. E. D. Pridie.
2. A framed portrait in black and white of the late Lord Kitchener kindly presented by Alfred Eff. Diab. The portrait has been hung in the common room in the Students' Hostel.

SPECIAL LECTURES.

A special lecture on : “SCOTLAND,” illustrated by an epidiascope demonstration of views was given by Capt. Rev. J. A. Williamson, C.F., and was much appreciated.

GAMES.

In May an Arabic play, “El Abbasa,” was produced in Atbara by the students in order to raise funds for the purpose of building a lawn tennis court. The play proved a success, both artistically and financially, and a hard court was built in the grounds of the Medical School.

HEALTH

OF THE

SUDAN DEFENCE FORCE

BY MR. N. MACLEOD.

GENERAL.

The health of the Sudan Defence Force was unaffected by any epidemic disease in 1935. With the exception of one case, in El Obeid, the Kordofan units escaped the cerebrospinal meningitis which was rampant in the province, and the Darfur units were similarly untouched.

While the total strength of the Force was almost identical with that of 1934, the number of admissions to hospital in 1935 was 800 less than in 1934.

The following table compares the sickness rates for the last eleven years:—

YEAR	Average Annual Strength	Admissions	Average Constantly Sick	Ratio per 1000 of strength		Days lost through sickness	
				Admissions	Average Constantly sick	for whole force	for those sick
1925	12,320	7,232	246.23	587.01	19.98	7.29	12.42
1926	9,813	5,138	172.5	523.59	17.57	6.41	12.25
1927	8,809	5,396	149.36	612.55	16.95	6.18	10.1
1928	7,086	4,840	157.86	683.03	22.27	8.14	11.9
1929	7,024	4,916	145.2	699.88	20.67	7.54	10.78
1930	6,527	4,817	158.91	738.01	24.34	8.88	12.04
1931	5,333	4,194	96.65	786.42	18.11	6.61	8.41
1932	4,828	4,054	111.7	839.68	23.13	8.44	10.05
1933	4,919	4,097	120.5	832.89	24.49	8.94	10.73
1934	4,715	4,219	132.27	894.80	28.05	10.24	11.44
1935	4,726	3,419	121.34	723.44	25.67	9.41	13.0

Bilharzia.

20 cases were under treatment during the year, 12 of whom (who contracted the disease elsewhere) were admitted in Khartoum.

Kala-Azar.

Kapoeta was the only station in which soldiers were infected with kala-azar ; 4 cases having occurred there with no deaths. Gedaref, for the first time, produced no cases, a state of affairs which it is hoped will continue.

In 1934 the admissions of kala-azar were 11 with no deaths.

In 1933 the admissions were 17 with 4 deaths.

Malaria.

As in previous years, malaria was the disease responsible for the greatest amount of incapacity, most marked in Kassala Province, Shendi and Fasher. In the case of Shendi most of the infections were acquired during the absence of the unit from its home station.

The Khartoum admissions, however, were only 27 in comparison to 104 in 1934, and Kassala figures exceed those of 1934 by only 6 despite changes of station during the rains and post-rains period. A company of the Eastern Arab Corps stationed in a malarious locality, during September and October, the worst mosquito months of the year in that area, remained singularly free from malaria as the result of daily quinine chemoprophylaxis. On returning, however, to their home station and on the cessation of prophylaxis 38% were admitted to hospital with malaria. Quinine is not regarded as a parasitic prophylactic but it may be considered of value in temporarily suppressing the symptoms of the disease and in enabling a community to carry out a specified task within a limited period for time.

The following table shows the admissions for malaria during the past eleven years :—

YEAR.							Cases.	Ratio per 1,000 of strength.
1925	...	...	...	...	...	...	1,131	91.8
1926	...	...	...	...	...	...	932	94.97
1927	...	...	...	...	...	...	948	107.7
1928	...	...	...	...	...	...	698	98.5
1929	...	...	...	...	...	...	1,165	165.86
1930	...	...	...	...	...	...	706	108.16
1931	...	...	...	...	...	...	741	138.94
1932	...	...	...	...	...	...	810	167.7
1933	...	...	...	...	...	...	1,140	231.77
1934	...	...	...	...	...	...	1,185	272.5
1935	...	...	...	...	...	...	894	187.5

Venereal Diseases—There is nothing in the venereal situation that need cause any alarm. The figures compare favourably with those of troops of other nationalities, but it is imperative that the measures of prevention at present carried out, periodical inspection, thorough treatment and encouragement to report for early treatment, judicious propaganda, should not be relaxed. It has to be remembered that, although the average Sudanese soldier regards gonorrhoea as only a disease of minor discomfort and one causing little inconvenience, he is still susceptible to the sequelae of gonorrhoea, and early and complete treatment is essential if he is to remain fit for his duties.

559 cases of venereal disease including syphilis, gonorrhoea, and soft sore, were treated in 1935.

593 cases received treatment in 1934.

YEAR.	ARABS.		EQUATORIAL.	
	Admissions.	Ratio per 1000 of strength.	Admissions.	Ratio per 1000 of strength.
1925	1,283	125.12	110	78.68
1926	878	141.08	145	100.34
1927	742	115.76	39	28.55
1928	611	89.48	86	69.8
1929	646	111.09	80	58.73
1930	685	106.91	64	46.98
1931	594	135.4	49	51.81
1932	570	143.0	57	67.69
1933	595	145.44	52	62.8
1934	561	144.3	32	38.6
1935	501	128.7	58	69.6

Deaths. 13 deaths occurred during the year; 5 died as the result of pneumonia—3 in Khartoum, 1 in Torit and 1 in Aweil; 2 died from blackwater fever, 1 in Khartoum and 1 in Geneina.

1 died from pulmonary tuberculosis in Khartoum, 1 died from disease of the circulatory system in Geneina, 3 died from diseases of the alimentary system, 1 in Geneina, 1 in Gedaref and 1 in Torit.

1 died as the result of gonorrhoea in Gedaref.

The following table shows the sick rate, admissions, etc., by stations.

STATIONS.	Average Annual Strength	Admissions	Total No. of days sickness	Average constantly sick	Average No. days lost through sickness	
					Whole Force	Those sick
Khartoum	760	351	6,849	18.76	9.0	19.5
Shendi	590	457	5,804	15.9	9.8	12.7
Obeid	357	147	2,303	6.31	6.4	15.7
Dilling	97	101	1,595	4.37	16.7	15.8
Bara	364	196	1,981	5.42	5.4	11.1
Kadugli	97	121	1,589	4.35	16.4	13.1
Kassala	194	144	1,606	4.4	8.3	11.1
Gedaref and Gallabat	586	477	5,295	14.5	9.0	9.7
Fasher	436	281	4,547	12.45	10.4	16.2
Geneina	206	126	1,082	2.96	5.3	8.3
Nyala	206	179	2,591	7.09	12.6	14.5
Torit	261	252	3,089	8.46	11.8	12.3
Kapoeta	143	137	2,042	5.6	14.2	14.9
Taali	143	171	1,891	5.18	13.2	11.1
Wau	143	116	1,168	3.2	8.3	10.0
Aweil	143	93	1,058	2.9	7.4	11.4
TOTALS	4,726	3,419	44,490	121.34	9.41	13.0

MEDICAL WORK CARRIED OUT BY MISSIONS.

The death of Dr. K. G. Frazer at Lui Hospital in January, 1935 deprived the medical profession and the Church Missionary Society in the Sudan of an outstanding personality and a brilliant colleague.

The medical organisation which he built up among the Moru tribe will remain a lasting memorial to his devotion and his self-sacrifice.

MISSION HOSPITALS.

1. Omdurman. (Church Missionary Society).

STAFF :— 3 British doctors.

5 British nurses.

1 British dispenser.

Beds	...	...	...	60	Outpatient attendances	...	51,625
Inpatients	...	...	...	1,205	Operations performed	...	315
Abu Ruf dispensary,	...	...	...	...	Outpatient attendances	...	19,898

This hospital maintains its high standard of efficiency and all the facilities provided are fully utilised. The child-welfare centre continues to serve a most useful purpose.

36 lepers, resident in Omdurman, were under outpatient treatment at this hospital at the end of the year.

2. Lui, Mongalla Province. (Church Missionary Society).

STAFF :— 1 British doctor.

3,473 Inpatients.

24,862 Outpatient attendances.

3. Melut, Upper Nile Province (Sudan United Mission).

STAFF :— 1 British doctor.

Beds	...	...	...	40	Outpatient attendances	...	4,527
Inpatients	...	...	...	272	Operations performed	...	3

4. Nasir, Upper Nile Province (American Mission).

STAFF :— 1 doctor and 2 nurses.

Outpatient attendances	...	...	...	...	...	18,121
Operations performed	...	...	...	...	...	40

5. Moro Hills, Kordofan Province (Sudan United Mission).

STAFF :— 1 British doctor.

Outpatient attendances	3,322
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6. Sallara, Kordofan Province (Church Missionary Society).

STAFF :— 1 British lady doctor and 1 nurse.

Outpatient attendances	5,289
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Mission Dispensaries (Upper Nile Province).

								Outpatient attendances.
Rom	4,243
Detwok	...	...	...	...	...	...	...	12,495
Lul	...	...	...	...	...	...	...	4,243
Ler	...	...	...	...	...	...	...	7,473
Doleib Hill	...	...	...	...	...	...	...	3,991

Mission Dispensaries (Kordofan Province).

								Outpatient attendances.
Abu Leili	...	...	...	...	...	...	...	3,322
Abri	...	...	...	...	...	...	...	8,941
Tabanya	...	...	...	...	...	...	...	3,442

(Sgd.) E. D. PRIDIE,

*Director,
Sudan Medical Service.*

STAFF & ORGANISATION.

(A) BRITISH STAFF.

Administration.

Director—who is responsible for the medical, public health, and medical research work carried out in the Sudan, and for the health of the Sudan Defence Force.

Assistant Director (Public Health) who deals with questions concerning preventive medicine.

Assistant Director (Hospitals) who deals with questions concerning curative medicine.

Assistant Director (Laboratories) who deals with laboratory and research work.

Superintendent

Superintendent of Accounts.

Chief Clerk

Chief Storekeeper

Assistant Storekeeper

Special Appointments.

Medical Specialist

Surgical Specialist

Ophthalmic Surgeon

Obstetrical and Gynaecological Specialist

Medical Officer of Health, Khartoum.

**Medical Registrar seconded to the
Kitchener School of Medicine.**

Medical Staff

33 Senior Medical Inspectors and Medical Inspectors. Matron, 4 Charge Sisters and 10 Nursing Sisters. Radiographer.

Public Health Staff.

15 Sanitary Inspectors.

Inspectress of Midwives, and Matron Midwifery Training School.

Laboratories Staff.

2 Bacteriologists.

4 Laboratory Assistants.

(B) SYRIAN STAFF.

8 Medical Officers, who are being replaced by Sudanese.

2 Dispensers.

(C) SUDANESE STAFF.

Medical Staff.

53 Medical Officers who have been trained at the Kitchener School of Medicine.

227 Assistant Medical Officers. These are selected after several years' training as hospital orderlies, and given a course lasting a year. If they pass the requisite examination, they are placed in charge of dispensaries.

Hospital Orderlies

Female Nurses.

Sheikhs' Dressers and Chiefs' Dressers. These men, who are selected by the Sheikh or Chief concerned from his tribe, carry out simple treatment and report epidemics among the nomad Arabs of the north and the pagan negro tribes of the south.

Public Health Staff.

Sanitary Officers (*See* page 34) and **Sanitary Overseers** (*See* page 34).

Subordinate Sanitary Staff. (House-to-house inspectors, mosquito-men, etc.)

Midwives. These are trained at the Midwifery School, and practise under the supervision of the public health authorities.

Laboratories Staff.

Laboratory Assistants of whom 10 are working at the Stack Medical Research Laboratories, and the remainder at hospitals.

APPOINTMENT.	Establishment.
Medical Staff.	
Director	1
Assistant Director (Public Health)...	1
Assistant Director (Hospitals) ...	1
Senior Physician	1
Senior Surgeon	1
Obstetric Surgeon and Gynaecologist	1
Ophthalmic Surgeon	1
Senior Medical Inspectors	12
Medical Inspectors	22
Syrian Medical Officers	8
Sudanese Medical Officers	53
Assistant Medical Officers	227
Dispensers	2
Radiographer	1
Assistant Radiographers	2
Stack Medical Research Laboratories.	
Assistant Director, Laboratory Services	1
Government Bacteriologists	2
Laboratory Assistants (British)	4
Laboratory Assistants (Sudanese)	10
Nursing Staff.	
Inspectress of Midwives	1
Matron, Midwifery Training School	1
Matron	1
Charge Sisters	4
Nursing Sisters	10
Sanitary Staff.	
Chief Sanitary Inspector	1
Senior Sanitary Inspectors	9
Sanitary Inspectors	5
Sanitary Officers	3
Sanitary Overseers	10
Clerical Staff.	
Superintendent	1
Staff Clerk	1
Clerks	17
Superintendent of Accounts...	1
Chief Accountant	1
Book-keepers	55
Medical Stores Staff.	
Chief Storekeeper	1
Storekeeper (British)	1
Storekeepers (Sudanese)	6
Storemen	9
Tailor	1
Carpenter	1

BRITISH MEDICAL STAFF

SUDAN MEDICAL SERVICE.

ON 31.12.1935.

Director,	...	...	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S.
Asst. Director (Public Health)			Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S. L.R.C.P., D.P.H.
Asst. Director, (Hospitals)	...		Mr. N. MacLeod, M.B., Ch.B.
Registrar, School of Medicine	...		Mr. D. R. Macdonald, M.B., Ch.B.

SPECIALIST APPOINTMENTS.

Senior Physician	...	...	Dr. R. M. Humphreys, D.M., B.Ch.
Senior Surgeon	...	...	Mr. F. S. Mayne, M.B., F.R.C.S.E.
Obstetric Surgeon and Gynaecologist			Mr. J. S. Hovell, M.B., F.R.C.S.E., M.C.O.G.
Ophthalmic Surgeon	...	...	Mr. A. R. McKelvie, M.B., Ch.B.

MEDICAL SECTION.

Senior Medical Inspector	...		Lt.-Col. G. K. Maurice, D.S.O., M.C., M.R.C.S., L.R.C.F.
"	"	"	...
"	"	"	Dr. A. Cruickshank, M.D. B.Ch.
"	"	"	...
"	"	"	Mr. A. E. Lorenzen, M.R.C.S. L.R.C.P.
"	"	"	...
"	"	"	Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P.
"	"	"	...
"	"	"	Mr. F. E. Anderson, M.B., B.Ch.
"	"	"	...
"	"	"	Mr. F. H. Goss, M.C., M.B., B.Ch.
"	"	"	...
"	"	"	Dr. L. H. Henderson, M.D., Ch.B., D.T.M. & H.
"	"	"	...
"	"	"	Mr. E. P. Pratt, M.B., B.S.
"	"	"	...
"	"	"	Mr. J. W. Wallace, M.B., B.Ch.
"	"	"	...
"	"	"	Mr. G. D. Rankin, M.B., B.Ch.

Senior Medical Inspector	...	Mr. H. M. Elliott, B.Ch.
„ „ „	...	Mr. J. Bryant, M.B., Ch.B., F.R.C.P.E., D.T.M. & H.
„ „ „	...	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. E. W. T. Morris, F.R.C.S.
„ „ „	...	Mr. H. M. Woodman, M.B., B.Ch.
„ „ „	...	Mr. A. P. Farmer, M.B., B.S., D.T.M. & H.
„ „ „	...	Dr. N. L. Corkill, M.M., M.D., Ch.B.
Medical Inspector	... ..	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. & H.
„ „	... ..	Mr. L. Brown, M.R.C.S., L.R.C.P.
„ „	... ..	Dr. R. McN. Buchanan, M.D., Ch.B., D.T.M. & H.
„ „	... ..	Mr. H. Richards, M.B., B.S., D.T.M. & H.
„ „	... ..	Mr. E. K. Malone, M.B., B.Ch., B.A.O.
„ „	... ..	Mr. J. L. D. Roy, M.B., Ch.B.
„ „	... ..	Mr. F. Bartholomew, F.R.C.S.E.
„ „	... ..	Mr. R. W. Stephenson, M.R.C.S., L.R.C.P.
„ „	... ..	Mr. F. L. Wheaton, M.B., B.S.
„ „	... ..	Mr. J. F. E. Bloss, M.R.C.S., L.R.C.P., D.T.M. & H.
„ „	... ..	Mr. W. H. Greany, M.B., B.Ch.
„ „	... ..	Mr. A. Royland Hunt, L.R.C.P., L.R.C.S. (Ed.)
„ „	... ..	Mr. G. C. Cochrane, M.R.C.S., L.R.C.P.
„ „	... ..	Mr. R. B. U. Somers, M.B., Ch.B., D.T.M. & H.
„ „	... ..	Mr. W. F. Townsend Coles, M.B., B.S.

STACK MEDICAL RESEARCH LABORATORIES.

Adviser in Medical Research	...	Sir Robert Archibald, C.M.G., D.S.O., M.D.
Asst. Director Laboratory Services	... ..	Dr. E. S. Horgan, B.A., M.D., B.Ch., B.A.O.
Bacteriologist	... ..	Mr. R. Kirk, M.B., Ch.B., B.Sc., F.R.F. P.S.G., D.P.H.

TABLE I.

SHOWS ADMISSIONS AND DEATHS BY DISEASES.

DISEASE.				TOTAL.							
				Europeans.				Non-Europeans.			
				Male.		Female.		Male.		Female.	
				A.	D.	A.	D.	A.	D.	A.	D.
Table "A"											
Tubercular											
1.	Disease of lung ...	...	...	7	1	—	—	385	78	109	17
2.	All other tubercular diseases ...			—	—	—	—	274	35	97	9
Venereal											
3.	Syphilis ...	...	...	6	—	—	—	5,796	25	4,801	11
4.	Gonorrhoea ...	...	...	6	—	1	—	1,782	2	349	2
5.	Soft Sore ...	...	...	—	—	—	—	447	—	23	—
Eye.											
6.	Trachoma...	...	...	2	—	—	—	532	—	252	—
7.	All other eye diseases ...	...	...	5	—	—	—	1,736	—	1,212	—
8.	Ear ...	...	...	2	—	—	—	192	2	69	—
9.	Skin ...	...	...	1	—	—	—	1,226	2	613	1
10.	Wounds and other injuries ...			57	1	8	1	14,945	164	4,725	71
Tumours.											
11.	Malignant ...	...	...	—	—	1	—	110	19	59	11
12.	Non-Malignant ...	...	...	—	—	—	—	313	3	171	7
Of Women.											
13.	Gynaecological ...	...	...	—	—	13	—	—	—	610	8
14.	Confinements ...	...	...	—	—	25	—	—	—	397	10
15.	Poisoning ...	...	...	—	—	2	—	81	1	36	3
Total Table "A" ...				86	2	50	1	27,819	331	13,613	150
Table "B" (Tropical).											
1.	Ancylostomiasis ...	...	...	—	—	—	—	412	13	160	2
2.	Bilharziasis ...	...	...	—	—	—	—	883	5	95	—
3.	Blackwater Fever ...	...	...	4	1	1	1	13	7	—	—
4.	Dysentery, Amoebic ...	...	...	8	—	7	—	1,844	32	660	18
5.	Dysentery, Bacillary ...	...	...	10	—	3	—	185	6	36	1
6.	Filariasis ...	...	...	—	—	—	—	98	2	9	—
7.	Madura disease ...	...	...	—	—	—	—	195	2	46	1
8.	Malaria ...	...	...	61	1	8	—	7,028	42	1,425	9
9.	Leishmaniasis (Kala-Azar) ...			—	—	—	—	134	54	37	12
10.	Trypanosomiasis...	...	...	—	—	—	—	4	2	—	—
11.	Yaws ...	...	...	—	—	—	—	939	3	786	2
12.	Sunstroke...	...	...	—	—	—	—	10	1	2	—
13.	Heatstroke ...	...	...	—	—	—	—	—	—	—	—
14.	Guinea Worm ...	...	...	—	—	—	—	682	1	131	—
15.	Tropical Ulcer ...	...	...	—	—	—	—	1,698	8	1,255	3
Total Table "B" ...				83	2	19	1	14,125	178	4,642	48

TABLE I. (Continued).

Disease.					TOTAL.							
					Europeans.				Non-Europeans.			
					Male.		Female.		Male.		Female.	
					A.	D.	A.	D.	A.	D.	A.	D.
Table " C " (Infective).												
1.	Anthrax	...	...	...	—	—	—	—	—	—	—	—
2.	Beri-beri	...	...	...	—	—	—	—	1	1	—	—
3.	Cerebrospinal-Meningitis	...	...	...	—	—	—	—	167	94	51	31
4.	Chicken Pox	...	...	...	—	—	—	—	493	—	32	—
5.	Cholera	...	...	...	—	—	—	—	—	—	—	—
6.	Dengue	...	...	...	—	—	—	—	—	—	—	—
7.	Diphtheria...	...	...	...	1	—	5	—	24	4	18	3
8.	Enteric (Including Paratyphoid)	...	...	...	3	—	1	—	155	22	87	14
9.	Erysipelas	...	...	...	1	—	—	—	4	—	—	—
10.	Gastro enteritis of children	...	...	...	1	—	—	—	32	10	5	1
11.	Influenza	...	...	...	23	—	9	—	700	8	133	—
12.	Leprosy	...	...	...	—	—	—	—	104	12	47	3
13.	Malta Fever	...	...	...	—	—	—	—	24	2	4	—
14.	Measles	...	...	...	—	—	—	—	279	2	72	2
15.	Mumps	...	...	...	—	—	1	—	210	—	8	—
16.	Pellagra	...	...	...	—	—	—	—	1	—	—	—
17.	Puerperal Fever	...	...	...	—	—	—	—	—	—	24	7
18.	Phlebotomus Fever	...	...	...	—	—	—	—	—	—	—	—
19.	Plague	...	...	...	—	—	—	—	—	—	—	—
20.	Pneumonia (Epidemic)	...	...	...	4	1	—	—	1,045	229	272	55
21.	Rabies *	...	...	...	—	—	—	—	30	5	17	2
22.	Relapsing Fever	...	...	...	—	—	—	—	—	—	—	—
23.	Rheumatic Fever	...	...	...	3	—	—	—	285	2	73	2
24.	Small Pox	...	...	...	—	—	—	—	32	1	6	—
25.	Tetanus	...	...	...	—	—	—	—	15	12	4	2
26.	Typhus	...	...	...	—	—	—	—	—	—	—	—
27.	Whooping Cough	...	...	...	—	—	—	—	16	2	15	1
Total Table " C "					36	1	16	—	3,617	406	868	123
Table " D."												
1.	Circulatory System	...	...	...	4	—	—	—	570	83	270	38
2.	Respiratory System	...	...	...	22	1	1	1	2,346	119	618	21
3.	Alimentary System	...	...	...	85	1	20	—	3,190	199	940	64
4.	Genito-Urinary System	...	...	...	14	—	3	—	1,645	55	186	13
5.	Nervous System	...	...	...	14	1	3	—	407	21	126	11
6.	Scurvy	...	...	...	—	—	—	—	45	1	11	—
7.	Diabetes	...	...	...	—	—	—	—	52	4	34	1
8.	Fever of uncertain origin	...	...	...	11	1	6	—	601	35	109	8
9.	All other diseases	...	...	...	24	—	7	—	7,680	48	5,065	22
Total Table " D "					174	4	40	1	16,536	565	7,359	178
" " " A "					86	2	50	1	27,819	331	13,613	150
" " " B "					83	2	19	1	14,125	178	4,642	48
" " " C "					36	1	16	—	3,617	406	868	123
Grand Total					379	9	125	3	62,097	1,480	26,482	499

* Includes cases admitted for Anti-rabic treatment.

TABLE II.
SHOWS ADMISSIONS AND DEATHS IN HOSPITALS DURING 1935.

	EUROPEAN.			NON-EUROPEAN.		
	Adm.	Died	%	Adm.	Died.	%
Bahr El Ghazal Province :—						
Wau	—	—	—	3,207	66	2.05
Rumbek	—	—	—	1,328	49	3.69
Aweil	—	—	—	507	6	1.18
Raga	—	—	—	644	—	—
Tonj	—	—	—	485	—	—
Province Dispensaries ...	—	—	—	3,192	—	—
Blue Nile Province :—						
Wad Medani	90	—	—	3,962	185	4.67
Wad Medani Prison ...	—	—	—	270	5	1.85
Abu Usher	—	—	—	1,713	77	4.49
Sennar	—	—	—	1,428	63	4.41
Singa	2	—	—	1,214	44	3.62
Roseires	2	—	—	932	37	3.97
Kurnuk	—	—	—	393	3	0.76
Province Dispensaries ...	...	—	—	247	2	0.81
Darfur Province :—						
Fasher	1	—	—	1,842	80	4.34
Geneina	—	—	—	1,716	41	2.39
Nyala	—	—	—	510	10	1.96
Zalingei	—	—	—	706	15	2.12
Province Dispensaries ...	—	—	—	4,181	14	0.33
Kassala Province :—						
Kassala	8	—	—	1,704	110	6.45
Gedaref	—	—	—	1,059	63	6.94
Port Sudan	80	2	2.5	1,813	48	2.64
Port Sudan Prison ...	—	—	—	41	3	7.31
Suakin	—	—	—	107	1	0.93
Suakin Quarantine ...	—	—	—	30	3	10.00
Province Dispensaries ...	—	—	—	1,546	12	0.77
Khartoum Province :—						
Khartoum	186	7	8.76	2,537	173	6.81
Omdurman	—	—	—	2,055	91	4.42
Khartoum North ...	—	—	—	919	4	0.43
River Hospital	10	—	—	1,414	11	0.77
Gebel Aulia	45	1	2.22	1,441	29	2.01
Kordofan Province :—						
Obeid	—	—	—	1,836	121	65.9
Nahud	—	—	—	1,328	48	3.61
Kadugli	—	—	—	1,156	27	2.33
Dilling	—	—	—	1,220	14	1.14
Talodi	—	—	—	1,015	11	1.08
Province Dispensaries ...	—	—	—	8,630	83	9.06

TABLE II—(Continued).

	EUROPEAN.			NON-EUROPEAN.		
	Adm.	Died	%	Adm.	Died.	%
Mongalla Province :—						
Juba	3	—	—	3,665	32	0.87
Yei... ..	—	—	—	596	10	1.67
Torit	—	—	—	941	9	0.95
Kapoeta	—	—	—	647	8	1.23
Li Ranga	—	—	—	1,077	27	2.50
Meridi	—	—	—	1,293	10	0.77
Source Yubu	—	—	—	834	23	2.76
Province Dispensaries ...	—	—	—	7,195	40	0.55
Northern Province :—						
Atbara	66	2	3.05	2,947	68	2.31
Shendi	—	—	—	449	9	2.00
Merowe	—	—	—	741	36	4.85
Dongola	—	—	—	695	17	2.44
Wadi Halfa	3	—	—	1,156	28	2.42
Province Dispensaries ...	—	—	—	1,169	6	0.51
Upper Nile Province :—						
Malakal	8	—	—	2,864	48	1.67
Province Dispensaries ...	—	—	—	2,151	—	—
White Nile Province :—						
Dueim	—	—	—	955	23	2.40
Kosti	—	—	—	875	36	4.11
TOTAL	504	12	2.38	88,579	1,979	2.23

GRAND TOTAL ... 89,083 admissions, with 1,991 deaths.

TABLE III.
VACCINATIONS PERFORMED DURING THE YEAR 1935.

PROVINCE.	PRIMARY.			RE-VACCINATION.			TOTAL.
	Success.	Failed.	Unknown	Success.	Failed.	Unknown	
Bahr El ...							
Ghazal ...	—	—	6,319	—	—	—	6,319
Blue Nile	9,736	7,794	12,038	—	—	—	29,568
Darfur ...	1,059	34	544	—	—	—	1,637
Kassala ...	3,072	726	1,092	576	1,489	645	7,600
Khartoum	3,361	1,138	2,022	—	—	—	6,521
Kordofan ...	158	56	475	9	4	3	705
Mongalla ...	—	—	—	—	—	—	—
Northern ...	12,926	4,870	5,755	—	—	—	23,551
Upper Nile	11,497	2,182	7,435	1,073	1,142	2,354	25,683
White Nile	5,787	930	4,746	79	66	312	11,920
TOTAL ...	47,596	17,730	40,426	1,737	2,701	3,314	113,504

TABLE IV.
SHOWS IN-PATIENTS, OUT-PATIENTS, ENDEMIC DISEASES AND OPERATIONS DURING 1934 AND 1935.

PROVINCE.	Hospi- tals	Dispen- saries	In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ancylo- stomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1934	1935	1934	1935	1934	1935	1934	1935	1934	1935	1934	1935	1934	1935	1934	1935
Bahr-el-Ghazal ...	2	19	12,823	9,364	478,471	341,540	332	275	868	266	972	1,122	1,010	1,141	7,057	3,358	1,163	1,232
Northern Prov.	5	46	7,274	7,226	1,482,656	1,419,271	8,600	3,734	155,503	104,563	543	473	38,570	33,803	3,931	3,858	1,441	1,110
Blue Nile ...	5	62	9,405	10,253	802,926	942,705	868	998	29,737	30,309	325	445	46,952	57,052	7,525	6,398	1,309	1,490
Darfur ...	3	18	7,867	8,956	259,492	274,060	672	634	5,838	4,852	629	38	2,586	2,571	11,293	10,449	564	721
Kassala ...	5	37	7,079	6,388	512,226	502,570	294	105	20,638	27,407	14	14	15,739	15,997	6,304	6,284	1,523	1,495
Khartoum ...	5	17	8,470	8,607	609,623	723,087	510	552	31,351	59,024	65	280	2,756	2,316	1,733	3,170	1,407	2,001
Kordofan ...	5	31	15,034	15,185	843,175	765,655	1,557	1,985	5,836	6,252	96	105	20,017	18,236	23,743	21,248	1,361	1,353
Mongalla ...	7	27	9,752	16,251	620,997	654,225	68	137	374	663	290	381	1,565	3,656	4,912	6,346	625	1,005
Upper Nile ...	1	23	6,412	5,023	180,797	223,476	51	29	3,368	2,273	84	71	9,258	8,187	17,203	17,577	380	405
White Nile ...	2	16	1,874	1,830	248,834	265,714	1,122	736	9,101	11,026	278	11	7,524	7,941	5,552	5,147	309	312
TOTALS ...	40	296	85,990	89,083	6,039,197	6,112,303	14,074	9,185	262,614	246,635	3,296	2,940	145,977	150,900	89,253	83,835	10,082	111,24

TABLE V.
LIST SHOWING HOSPITALS AND DISPENSARIES DURING 1935.

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Bahr el Ghazal Province.		Halfa District.		Fung District—Ctd.	
Wau	195	Wadi Halfa	74	El Sukki	—
Rumbek	108	Abri	—	Gule	—
Aweil	17	Akasha	—	Karkoj	4
Aluakluak	—	Attiri	—	Kurmuk	5
Gogrial	—	Delgo	—	Ora	—
Kashwal	—	Dobeira	—	Suada	—
Kuru	—	Fareig	—	Travelling Disp.	—
Luel	—	Suarda	—	Wisko	8
Madol	—				
Marial Ba	—				
Meshra	—	Blue Nile Province.		Darfur Province.	
Nyin Akok	—	Medani District.		El Fasher	138
Piele	—	Wad Medani	273	Geneina	35
Pongo	—	Sennar	127	Nyala	48
Raga	15	Abu Usher	140	Abu Matarig	—
Said Bundas	—	Abdel Galil	—	Buram	—
Sopo	—	Abdel Hakam	—	Deleig	—
Toinya	—	Abdel Rahman	—	Geneina Town	—
Tonj	11	Amara Kassir	—	Gorgor	—
Wun Rog	—	Debeiba	—	Id El Ghanam	—
Wun Shwai	—	Derwish	—	Kas	—
		Dolga	—	Kebkebia	—
		Efeina	—	Kubbum	—
		Fahal	—	Kuttum	2
		Futais	—	Meidob	—
Northern Province.		Gondal	—	Mistiri	—
Berber District.		Ghubshan	—	Sirri	—
Atbara	149	Hag Abdalla	—	Taweisha	—
Shendi (Civil)	42	Hamad El Nil	—	Um Buru	—
Shendi (Military)	35	Hassa Heissa	—	Um Keddada	—
Abidia	—	Hilalia	—	Wadaa	—
Abu Hamed	6	Hosh	—	Zalingei	18
Aliab	—	Istarihna	—		
Atmoor	2	Kab El Gidad	—		
Berber	8	Kamlin	—	Kassala Province.	
Bouga	4	Keteir	—	Kassala District.	
Darmali	—	Kumor	—	Kassala	153
El Damer	1	Laota	—	Gedaref (Civil)	60
Eneibis	3	Managil	—	Gedaref (Military)	32
Gadalla	2	Mealig	—	Abu Deleig	2
Gandettu	2	Medina	—	Akik	—
Hilgi	—	Meringan	—	Aroma	4
Kabushia	—	Messellamia	—	Car Dispensary	—
Kitiab	2	Nidiana	—	Derudeib	4
Metamma	—	Radma	—	Digein	—
Mograt Island	2	Remeitab	—	Doka	1
Monassir	2	Rufaa	—	Gallabat	7
Shereik	2	Sabi Deleib	—	Gebeit	13
Tayiba El Khawad	—	Seleima	—	Gebeit Mine	—
Timeirab	—	Shabarga	—	Gheit	—
Um Breika	—	Tabat	—	Goz Rogab	3
Wad Hamed	4	Tayiba	—	Galaat El Nahl	3
Zeidab	5	Tebub	—	El Hog	—
		Turabi	—	Hadalyia	—
Dongola District.		Um Degarsi	—	Hawata	2
Merowe	70	Wad El Ataia	—	Hillet Hokoma	—
Dongola	64	Wad El Bur	—	Kassab	—
Argo	—	Wad Hussein	—	Kassala Station	2
Affat	—	Wad Medani Prison	33	Khashm El Girba	2
Amentego	—	Wad Naaman	—	Khatmia	—
Badein	—	Wad Rawa	—	Mekali	—
Debba	—	Wad Saadalla	—	Metatib	—
El Seir	—	Wad Sulfab	—	Mefaza	—
Ghaba	—			Musmar	2
Gureir	—	Fung District.		Northern Trav. D.	—
Haffir	—	Singa	100	Oyo	—
Kareima	—	Roseires	100	Shalga	—
Khandak	—	Abu Hashim	—	Shawak	2
Korti	—	Abu Tiga	—	Sinkat	—
Mansurkotti	—	Attib	—	Southern Trav. D.	—
Nuri	—	Bardana	—	Tendelai	—
Tengasi	—	Bikeri	—	Tokar	18
		Dar Agil	—	Um Bereiga	—

TABLE V, *Ctd.*

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Port Sudan District.		Kordofan Province—<i>Ctd.</i>		Upper Nile Province.	
Port Sudan	120	Kauda	15	Malakal	200
Port Sudan Prison ...	13	Keilak	—	Abwong	9
Suakin	10	Kilogi	5	Akobo	20
Suakin Quarantine ...	30	Lagawa	6	Bor	10
P. Sudan East Side ...	—	Muglad	13	Detwok	6
		Muglad Trav. Disp. ...	—	Doleib Hill	—
Khartoum Province.		Rahad	7	Fungak	—
Khartoum	181	Rashad	15	Gambeila	5
Khartoum North	35	Shawai	10	Kaka	8
„ „ Prison	37	Sherkeila	—	Kodok	13
Omdurman	160	Soderi	6	Kongor	8
River Hospital	166	Soderi Trav. Disp. ...	—	S.S. Lady Baker ...	22
Gebel Aulia	102	Sug El Gamal	4	Ler	—
Ailafoun	—	Tira Limon	5	Lul Mission	—
Burri	—	Um Dorein	5	Melut	4
Deims	—	Um Ruaba	50	Nasser	5
Deim Saad	—			Pibor	12
Geili	1	Mongalla Province.		Renk	9
Gereif	—	Juba	160	Rom	—
Gordon's Tree	—	Yei	30	Shambe	40
Gordon College	—	Torit	64	S.S. Kerreri	—
Kheleila	—	Kapoeta	33	Tonga	12
Midwifery School ...	32	Meridi	36	Yirrol	26
Murada	—	Aiyerri	4	Yoynyang Mission ...	6
Omdurman Tech. Sch. ...	—	Badagbo	—		
Seleitat	2	Bilal	—	White Nile Province.	
Serurab	—	Falwall	—	Duein	52
Tuti	—	Gangura	—	Kosti	46
Wad Nubawi	—	Gog	—	Aba Island	2
		Ibba	—	Abu Rukba	1
Kordofan Province.		Idali	15	Dar El Ahamda ...	—
El Obeid	115	Ikotos	29	Fashishoya	—
Nahud	81	Kajo-Kaji	30	Gebelein	1
Kadugli... ..	100	Kirripi	7	Geteina	2
Dilling	100	Koggi	6	Kawa	—
Talodi	100	Kyala	14	Maatuk	1
Abbassia	20	Lafone	10	Naaina	1
Abu Gebeiha	5	Lau	—	Rahmania	—
Abu Zabad	29	Li Rangu	34	Shawal	—
Bara	22	Loa	—	Shigeig	1
Delami	40	Loka	10	S.R. Car Disp. ...	—
El Buram	10	Lyria	—	Tendelti	—
El Liri	15	Madragi	—	Tayiba	1
El Odaya	10	Makpandu	—	Turaa	—
Ermil	5	Migida	—		
Gardud	5	Ngindo	—		
Ghabeish	3	Opari	25		
Ghulfan... ..	15	Pini	—		
Hammadi	5	Source Yubu	18		
Heiban	15	Taali	10		
Katla	15	Terrakekka	4		
		Yambio	—		
				Total Beds Equipped = 5,031	

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THE ANGLO EGYPTIAN SUDAN



Sudan Survey Dept. Atlas Com. April 1922. 1:8,000,000. 414-22.
 Revised March 15, 1930, 1931, 1932, 1933.

Scale 1:8,000,000

Miles 100 50 0 100 200 300 400 Miles

Reference.

- RAILWAYS
- TELEGRAPHS OR TELEPHONES
- INTERNATIONAL BOUNDARIES
- PROVINCE BOUNDARIES
- WIRELESS STATIONS
- PROPOSED & EXISTING GINNERIES
- MOTOR ROADS
- LANDING GROUND - IMPERIAL AIRWAYS
- OTHER PRINCIPAL LANDING GROUNDS

SLEEPING SICKNESS AREA SHADED IN RED

MONGALLA PROVINCE BOUNDARY PRIOR TO 1927

